



**KING EDWARD VI**  
**COMMUNITY COLLEGE**

**Year 11 Higher Tier**  
**Revision Materials**  
**Booklet (1)**

# Year 11 Higher PPE Contents Page

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# Year 11 Higher PPE (2) Assessment Revision List

Choose the areas you need to practice and look at these on *Sparx Independent Learning*.

Remember your *Curriculum* must be set to *GCSE*.

Speak to your teacher if you have any questions.

| Paper 1                                              |
|------------------------------------------------------|
| Similar triangles                                    |
| Square mixed numbers                                 |
| Arc length                                           |
| Decimal to fraction                                  |
| Standard form                                        |
| Tree diagrams & probability with 2 events            |
| Reverse percentage                                   |
| Laws of indices                                      |
| Area and proportion                                  |
| Inverse proportion graph & reading from a graph      |
| Sharing ratio problem                                |
| Fibonacci-type sequence                              |
| Estimation and volume                                |
| Ratio and angles problem                             |
| Cumulative frequency                                 |
| Simplify algebraic fraction                          |
| Forming equations & evaluating method                |
| Calculation using identity & difference of 2 squares |
| Recurring decimal to fraction                        |
| Geometry proof & assumption                          |
| Simultaneous equations                               |
| Vector geometry                                      |
| Indices                                              |
| Trigonometric function                               |
| Perpendicular gradients & coordinate problem         |
| Turning point                                        |
| Exact trig values                                    |

| Paper 3                                                         |
|-----------------------------------------------------------------|
| Fraction $>1$                                                   |
| Probability                                                     |
| LCM                                                             |
| Roots                                                           |
| Enlargement fractional scale factor                             |
| Limits                                                          |
| Density                                                         |
| Rearrange formula                                               |
| Set up and solve an equation                                    |
| Compound interest                                               |
| Mean and ratio                                                  |
| Equation of a line                                              |
| Parallel vector & vector addition                               |
| Ratio with statements                                           |
| Multiplication of algebraic fractions                           |
| Sector area comparison                                          |
| Range and relative frequency                                    |
| Expansion and rearrangement & quadratic equation formula        |
| Criticising a box plot                                          |
| Direct proportion                                               |
| Ratio and percentage problem                                    |
| Venn diagram and conditional probability                        |
| Exponential graph                                               |
| 3D problem                                                      |
| Invariance                                                      |
| Composite function equation                                     |
| Equation of circle, ratio, cosine rule                          |
| Distance from speed time graph & average acceleration and units |

# Ratio and proportion – Higher



Sparx  
codes

|                                                            |      |
|------------------------------------------------------------|------|
| Using equivalent ratios to find unknown amounts            | U753 |
| Converting between ratios, fractions and percentages       | U176 |
| Sharing amounts in a given ratio                           | U577 |
| Problem solving: Sharing amounts in a given ratio (Higher) | U595 |
| Combining ratios                                           | U921 |

1  $x : y = 5 : 1$

1 (a) Circle the equation of  $y$  as a function of  $x$ .

[1 mark]

$$y = \frac{x}{6}$$

$$y = \frac{x}{5}$$

$$y = 5x$$

$$y = 6x$$

1 (b) Show that  $x + y : x - y = 3 : 2$

[2 marks]

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2 90 hazelnuts have a mass of 125 g  
Hazelnuts have 630 calories per 100 g

Work out the number of calories per hazelnut.

[3 marks]

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Answer \_\_\_\_\_ calories

**3** Jake, Kim and Lee share some money in the ratio 1 : 3 : 6

Kim gets £9 **more** than Jake.

How much does **Lee** get?

**[3 marks]**

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Answer £ \_\_\_\_\_

**4** A spice mix contains coriander and cumin in the ratio  $\frac{1}{2}$  cup :  $\frac{1}{4}$  cup

A cup of coriander is 80 grams.

A cup of cumin is 100 grams.

Work out the mass of 6 cups of the spice mix.

**[4 marks]**

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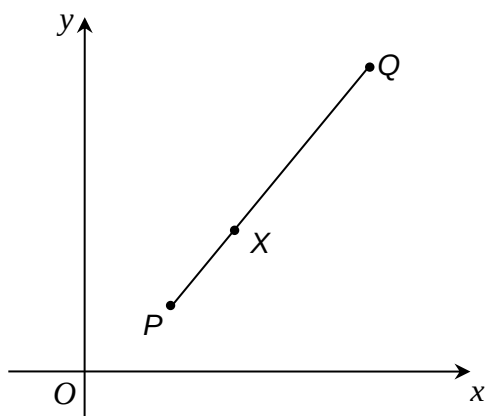
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Answer \_\_\_\_\_ grams

- 5  $X$  divides the line  $PQ$  in the ratio  $2 : 3$   
 $P$  is  $(2, 1)$  and  $Q$  is  $(12.5, 7.5)$



Not drawn  
accurately

Work out the coordinates of the point  $X$ .

[4 marks]

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Answer ( \_\_\_\_\_ , \_\_\_\_\_ )

**6** Bob sells hats and scarves.

At the start of the day, he has hats : scarves = 4 : 3

During the day he sells 25 hats.

At the end of the day, he has hats : scarves = 7 : 9

Work out the number of scarves he has.

**[3 marks]**

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Answer \_\_\_\_\_

# Growth and decay/compound interest - Higher



Sparx  
codes

|                                                      |      |
|------------------------------------------------------|------|
| Percentage change with a calculator                  | U671 |
| Finding original values in percentage calculations   | U286 |
| Finding the percentage an amount has been changed by | U278 |
| Simple interest calculations                         | U533 |
| Compound interest calculations                       | U332 |
| Growth and decay                                     | U988 |

- 1 Circle the multiplier that is equivalent to a percentage increase of 13%

[1 mark]

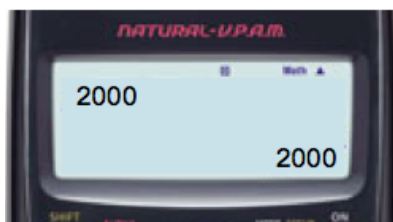
0.13

1.013

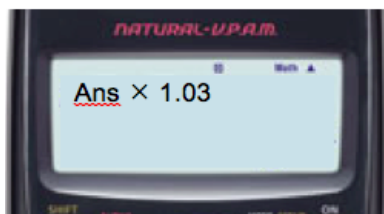
1.13

1.3

- 2 Martyn types 2000 into his calculator, then presses the equals key.  
The display looks like.



He then types the following and presses the equals key three times.



What value does his calculator finally show?

[1 mark]

Answer \_\_\_\_\_



- 3 Circle the formula that shows the amount,  $A$ , in an account when  $P$  pounds is invested for  $n$  years at an annual compound interest rate of  $r\%$ .

[1 mark]

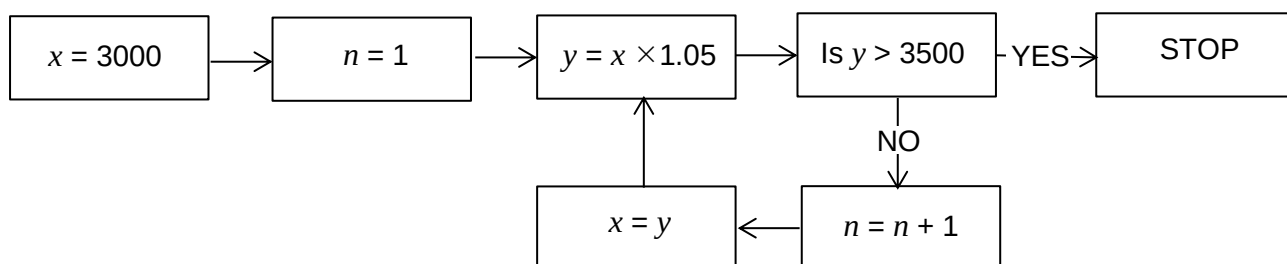
$$A = P^n + \left(\frac{Pr}{100}\right)^n$$

$$A = \left(P + \frac{Pr}{100}\right)^n$$

$$A = P\left(1 + \frac{r}{100}\right)^n$$

$$A = P \frac{(100 + r)^n}{100}$$

- 4 £3000 is invested at an annual compound interest rate of 5%.  
This iterative process is used to work out how many years it takes for the investment to reach over £3500



This table shows some of the values generated by the iterative process.

| $x$  | $n$ | $y$  |
|------|-----|------|
| 3000 | 1   | 3150 |
| 3150 | 2   |      |
|      |     |      |
|      |     |      |
|      |     |      |

Complete the table.  
You may not need to use all the rows.  
Round values off to 2 decimal places.

[3 marks]

- 5** Work out the **interest** when £4000 is invested at an annual compound interest rate of 3.8% for 4 years.

**[3 marks]**

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Answer £ \_\_\_\_\_

- 6** Work out how much will be in the account if £5000 is invested at an annual compound interest rate of 2.9% for 3 years.

**[3 marks]**

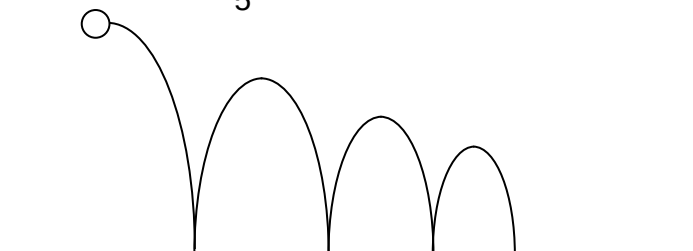
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Answer £ \_\_\_\_\_

- 7 A ball is dropped from a height of 10 metres.  
After each bounce it rises to  $\frac{3}{5}$  of its previous height.



Not drawn  
accurately

How many bounces will it take until the height reached is less than 1 metre?

[4 marks]

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Answer

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- 8 A quantity is increased by 10%, then increased by 10%, then decreased by 20%

Which of the following is true for the final value of the quantity?

Circle your answer.

[1 mark]

Decreases by 4%

Decreases by 3.2%

Stays the same

Increases by 1%

- 9 A water tank contains 10 000 litres.  
The tank develops a leak and loses 6% of the water remaining each day.  
After  $n$  days the volume is reduced by almost 50%

Work out the value of  $n$ .

You **must** explain your method clearly.

[3 marks]

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Answer \_\_\_\_\_

# Calculating with percentages – Higher



Sparx  
codes

|                                                     |      |
|-----------------------------------------------------|------|
| Writing numbers as percentages of other numbers     | U925 |
| Finding fractions of amounts without a calculator   | U881 |
| Finding fractions of amounts with a calculator      | U916 |
| Finding percentages of amounts without a calculator | U554 |
| Finding percentages of amounts with a calculator    | U349 |
| Percentage change without a calculator              | U773 |
| Percentage change with a calculator                 | U671 |
| Finding original values in percentage calculations  | U286 |

- 1 Circle the multiplier that is equivalent to a percentage increase of 15%

[1 mark]

0.015

0.15

1.015

1.15

- 2 A games console costs £100  
The cost is increased by 20%  
The new cost is decreased by 20%

Which of the following is true?  
Tick your choice.

[1 mark]

The final cost of the console is less than the original cost

☐

The final cost of the console is the same as the original cost

☐

The final cost of the console is more than the original cost

☐

- 3** A train fare costs £23.55  
All train fares are increased by 2.8%

Work out the new fare.

**[2 marks]**

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Answer £ \_\_\_\_\_

- 4** A savings account pays 3.6% per annum simple interest.  
Heidi puts £400 into the account.

How much will she have in the account after 5 years?

**[2 marks]**

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Answer £ \_\_\_\_\_

- 5** In one week the mass of a puppy increases from 1.8 kg to 2.25 kg

Work out the percentage increase of the mass.

**[2 marks]**

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Answer \_\_\_\_\_ %

- 6** In a sale all items are reduced by 30%  
On the final day the **sale prices** are reduced by 20%

- 6 (a)** Work out the **final day** price of a sofa that was priced at £290 before the sale started.  
**[3 marks]**

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Answer £ \_\_\_\_\_

- 6 (b)** Work out the percentage decrease between the original prices and the final day prices.  
**[2 marks]**

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Answer \_\_\_\_\_ %

- 7** After a 12% increase the cost of a new cooker is £190.40

Work out the original price of the cooker.

**[3 marks]**

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Answer £ \_\_\_\_\_

- 8** A running club has 270 members.  
There are 25% more men than women in the running club.

**8 (a)** How many men are in the running club?

**[2 marks]**

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Answer \_\_\_\_\_

- 8 (b)** 40% of the men and 30% of the women also belong to a cycling club.

Work out the percentage of the whole membership that belong to a cycling club.

**[2 marks]**

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Answer \_\_\_\_\_ %



# Number, fraction and decimals – Higher



Sparx  
codes

|                                                   |      |
|---------------------------------------------------|------|
| Estimating calculations                           | U225 |
| Ordering fractions                                | U746 |
| Multiplying fractions                             | U475 |
| Multiplying with mixed numbers                    | U224 |
| Converting recurring decimals to fractions        | U689 |
| Finding fractions of amounts without a calculator | U881 |
| Finding fractions of amounts with a calculator    | U916 |

1 Circle the smallest number.

[1 mark]

$$\frac{11}{20}$$

$$\frac{3}{10}$$

$$\frac{1}{5}$$

$$\frac{1}{4}$$

2 Circle the largest number.

[1 mark]

4.1

4.1

4.11

4.111

3 Circle the decimal that is equivalent to  $\frac{21}{20}$

[1 mark]

1.01

1.05

1.1

1.5

4 Work out  $47.15 \times 0.08$

[2 marks]

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Answer \_\_\_\_\_

5 Work out  $1\frac{2}{3} \times 4\frac{1}{5}$

Give your answer in its simplest form.

[2 marks]

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Answer \_\_\_\_\_

6 Use approximations to estimate the value of  $\frac{204 \times 3.99}{0.112}$   
You **must** show your working.

[3 marks]

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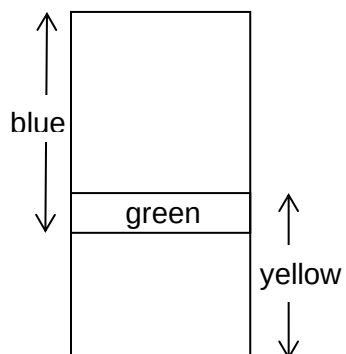
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Answer \_\_\_\_\_

7 Mia has a rectangle of cloth.

She dips the top  $\frac{5}{8}$  of the cloth in blue dye.

She dips the bottom  $\frac{9}{20}$  of the cloth in yellow dye.



Not drawn  
accurately

The part of the cloth that is dipped in both colours turns green.

Work out the fraction of cloth that turns green.

[3 marks]

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Answer \_\_\_\_\_

8 A show is on Friday, Saturday and Sunday.

$\frac{2}{5}$  of the **total** tickets sold are for the Saturday show.

240 tickets are sold for the Saturday show.

Three times as many tickets are sold for the Sunday show as for the Friday show.

How many tickets are sold for the Sunday show ?

[4 marks]

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Answer \_\_\_\_\_

9 Express  $0.\dot{2}\dot{3}$  as a fraction in its simplest form.

[3 marks]

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Answer \_\_\_\_\_

# Indices and roots – Higher



Sparx  
codes

Calculating with roots and powers

U851

Estimating roots and powers

U299

Index rules with positive indices

U235

Index rules with negative indices

U694

## Section A

10 minutes. Calculator.

1 Use your calculator to work out

1 (a)  $\frac{\sqrt{33.64}}{19.8 + 9.2}$

[1 mark]

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Answer \_\_\_\_\_

1 (b)  $\sqrt{\frac{6^4}{2^6}}$

[1 mark]

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Answer \_\_\_\_\_

2 What whole number power of 2 is 16 384?

[1 mark]

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Answer \_\_\_\_\_

3  $2^x \times 3^x = 1296$

Work out the value of  $x$

[1 mark]

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Answer \_\_\_\_\_

4 Work out  $\left(\frac{2^7 \times 3^5}{6^3}\right)^{\frac{1}{2}}$

[1 mark]

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Answer \_\_\_\_\_

- 5 Raj and his sister Zia are both at secondary school.  
Raj is three years older than Zia.  
The sum of the squares of their ages is 369

How old are they?

[2 marks]

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Zia = \_\_\_\_\_ years old

Raj = \_\_\_\_\_ years old

6 (a) Write  $\frac{11^{13} \times 11^3}{11^7}$  as a single power of 11

[1 mark]

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Answer \_\_\_\_\_

**6 (b)** Write  $(4^3)^5$  as a single power of 2

**[1 mark]**

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Answer \_\_\_\_\_

**7** Write 224 as the sum of two cube numbers.

**[1 mark]**

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Answer \_\_\_\_\_

## Section B

10 minutes. Non-calculator. Put your calculator away. You may still work on section A but you must **not** use a calculator.

**8** Estimate the square root of 90

**[1 mark]**

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Answer \_\_\_\_\_

**9** Between which two integers does the cube root of 80 lie?

**[1 mark]**

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Answer \_\_\_\_\_

**10** Write  $\sqrt{100 \text{ million}}$  as a power of 10

**[1 mark]**

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Answer \_\_\_\_\_

11 Solve the equation  $x^2 - 1 = 48$

[2 marks]

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Answer \_\_\_\_\_

12 Tina says,

“The difference between any 2 consecutive square numbers is **always** odd.”

Is she correct?

Yes

☐

No

☐

Give reasons for your answer.

[2 marks]

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13 Estimate the value of  $x$  when  $3^x = 25$

[1 mark]

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Answer \_\_\_\_\_



**14**  $a$  and  $b$  are whole numbers greater than 1.

Work out two **different** pairs of values for  $a$  and  $b$  for which  $a^b = 64$

**[2 marks]**

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First pair

$a =$  \_\_\_\_\_

$b =$  \_\_\_\_\_

Second pair

$a =$  \_\_\_\_\_

$b =$  \_\_\_\_\_

# Standard form – Higher



Sparx  
codes

|                                                   |      |
|---------------------------------------------------|------|
| Using standard form with positive indices         | U330 |
| Using standard form with negative indices         | U534 |
| Multiplying and dividing numbers in standard form | U264 |
| Adding and subtracting numbers in standard form   | U290 |
| Standard form with a calculator                   | U161 |

**1** Here are five numbers.

47 000

$4.5 \times 10^4$

$5 \times 10^3$

$2.8 \times 10^5$

125 000

Work out the difference between the largest and smallest numbers.

Give your answer in standard form.

**[3 marks]**

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Answer \_\_\_\_\_

**2** Work out  $(5.9 \times 10^7) \div (2.3 \times 10^4)$

Give your answer in standard form to 2 significant figures.

**[3 marks]**

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Answer \_\_\_\_\_

**3** Solve  $\frac{x}{0.02} = 3.1 \times 10^{-4}$

Give your answer in standard form.

**[2 marks]**

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$x =$  \_\_\_\_\_

**4** In total, tourists visiting a country spent  $\text{£}5.2 \times 10^8$

On average each tourist spent  $\text{£}645$

How many tourists visited the country?

Give your answer in standard form to an appropriate degree of accuracy.

**[3 marks]**

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Answer \_\_\_\_\_

**5** Here are the probabilities of two independent events.

|         |                      |
|---------|----------------------|
| Event A | $2.7 \times 10^{-2}$ |
| Event B | $3.4 \times 10^{-4}$ |

**5 (a)** How many times more likely is event A than event B?

**[2 marks]**

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Answer \_\_\_\_\_

- 5 (b)** Work out the probability of only one of the events happening.  
Give your answer to 3 significant figures.

**[4 marks]**

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Answer \_\_\_\_\_

- 6** In the body, the ratio of the number of red blood cells to the total of all cells = 5 : 9  
It is estimated that there are  $3.72 \times 10^{13}$  cells in total.

Work out the number of red blood cells.

Give your answer in standard form to an appropriate degree of accuracy.

**[3 marks]**

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Answer \_\_\_\_\_

# Forming and solving equations – Higher



Sparx  
codes

|                                          |      |
|------------------------------------------|------|
| Expanding single brackets                | U179 |
| Factorising into one bracket             | U365 |
| Solving equations with one step          | U755 |
| Solving equations with two or more steps | U325 |
| Constructing and solving equations       | U599 |

- 1 Circle the expression equivalent to  $6n - 3n \times 2n + n$  [1 mark]

$9n^2$

$6n^2 + n$

$7n - 6n^2$

$6n - 9n^2$

- 2 Expand  $a(a - 4)$   
Circle your answer. [1 mark]

$a^2 - 4a$

$a^2 - 4$

$2a - 4$

$-4a^2$

- 3 Factorise fully  $10x^2 - 5xy$  [2 marks]

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Answer \_\_\_\_\_

- 4  $3x(x + 12) \equiv 3x^2 + c^2x$   
Work out the possible values of  $c$ . [3 marks]

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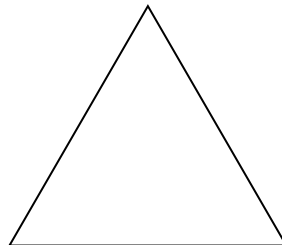
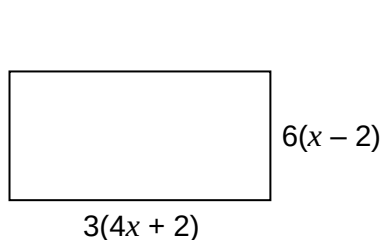
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Answer \_\_\_\_\_

- 5 The rectangle and the equilateral triangle have equal perimeters.



Not drawn  
accurately

Work out an expression, in terms of  $x$ , for the length of a side of the triangle.  
Give your answer in its simplest form.

[4 marks]

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Answer \_\_\_\_\_

- 6  $6(x - k) = 5x + 4$  where  $k$  is a positive integer.

Show that  $x$  must be an even number.

[3 marks]

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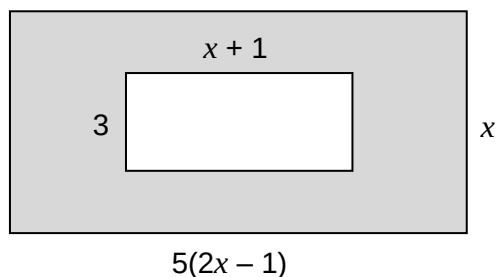
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- 7 The diagram shows two rectangles.  
All dimensions are in cm



Not drawn  
accurately

Work out an expression, in terms of  $x$ , for the shaded area.  
Give your answer in its simplest form.

[3 marks]

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Answer \_\_\_\_\_  $\text{cm}^2$

- 8 Write  $3(7x - 1) - 6(x + 4) + 2$  in the form  $a(bx + c)$   
where  $a$ ,  $b$  and  $c$  are integers and  $a > 1$

[3 marks]

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Answer \_\_\_\_\_

# Equations of lines – Higher



Sparx  
codes

|                                                                       |      |
|-----------------------------------------------------------------------|------|
| Plotting straight line graphs                                         | U741 |
| Finding equations of straight line graphs                             | U315 |
| Interpreting equations of straight line graphs                        | U669 |
| Finding the equation of a straight line from its gradient and a point | U477 |
| Finding the equation of a straight line from two points on the line   | U848 |
| Equations of parallel lines                                           | U377 |
| Equations of parallel and perpendicular lines                         | U898 |

- 1 Circle the line that is parallel to  $y = 2x + 8$

[1 mark]

$$y = \frac{1}{2}x + 8$$

$$y = 8 - 2x$$

$$y - 2x = 0$$

$$y = \frac{8-x}{2}$$

- 2 Circle the line that is perpendicular to  $y = 2x + 8$

[1 mark]

$$y = \frac{1}{2}x + 8$$

$$y = 8 - 2x$$

$$y - 2x = 0$$

$$y = \frac{8-x}{2}$$

- 3 Circle the line that passes through the origin.

[1 mark]

$$y = \frac{1}{2}x + 8$$

$$y = 8 - 2x$$

$$y - 2x = 0$$

$$y = \frac{8-x}{2}$$

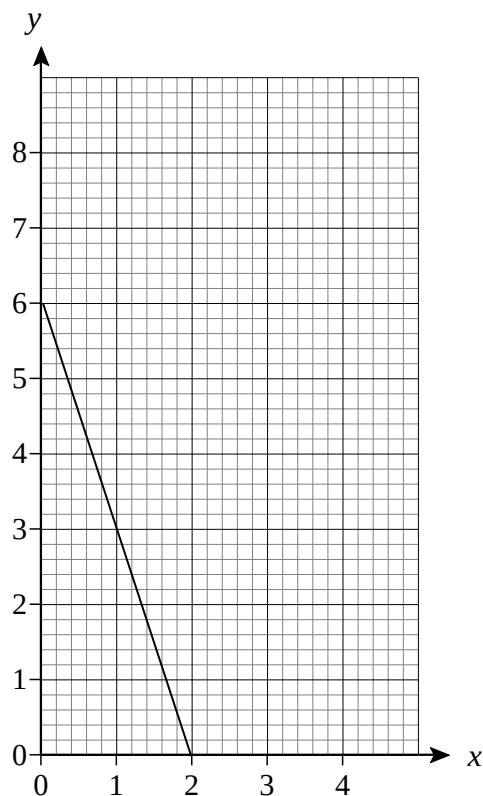
- 4 Work out where the line  $2y - 3x - 8 = 0$  crosses the y-axis.

[2 marks]

Answer ( \_\_\_\_\_ ), ( \_\_\_\_\_ )



5 Here is the graph of a straight line.



Work out the equation of the line.

[3 marks]

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Answer \_\_\_\_\_

6 Solve the equation  $3x + 14 = 2$

[2 marks]

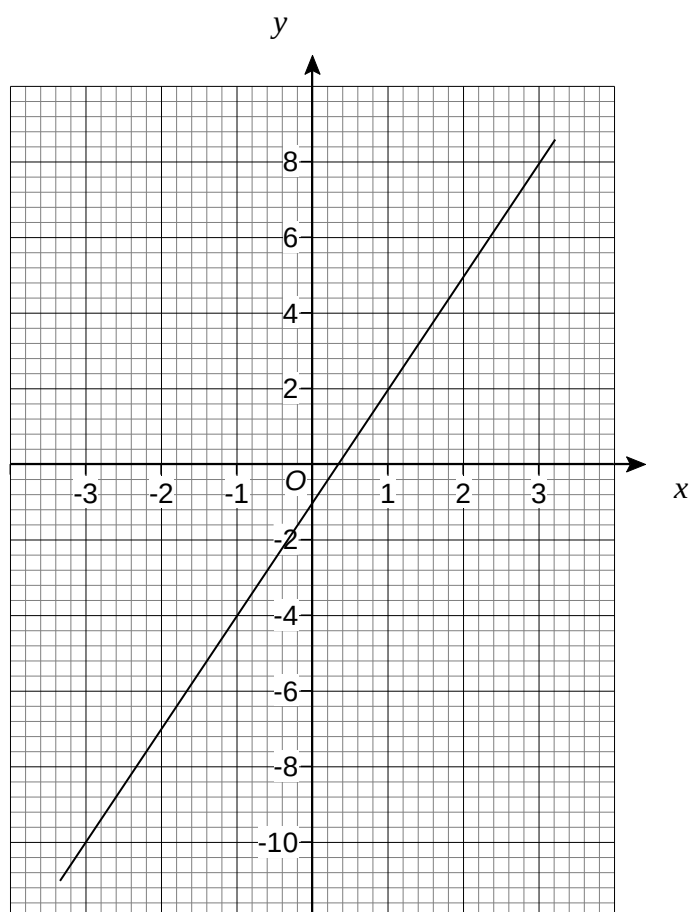
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$x =$  \_\_\_\_\_

7 Here is the graph of  $y = 3x - 1$



Use the graph to find the solution to  $3x - 1 = 0$

[1 mark]

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Answer \_\_\_\_\_

8 Solve the equation  $5x + 1 = 2(x + 4)$

[3 marks]

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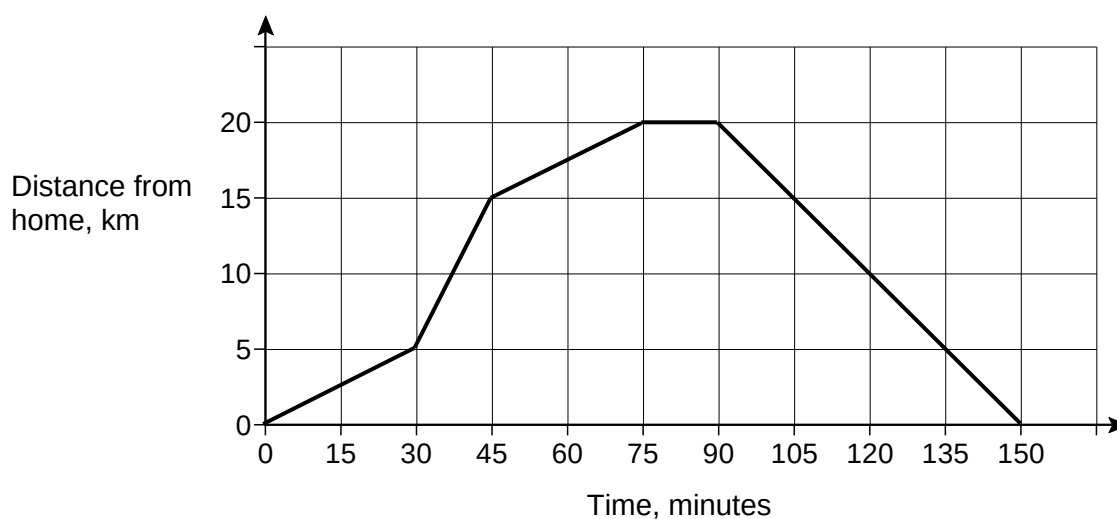
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Answer \_\_\_\_\_

9 Amy cycles from home to a park and back home.  
The graph shows her journey.



Amy stopped at the park for 15 minutes.

Work out her average speed from home to the park in kilometres per hour.

[2 mark]

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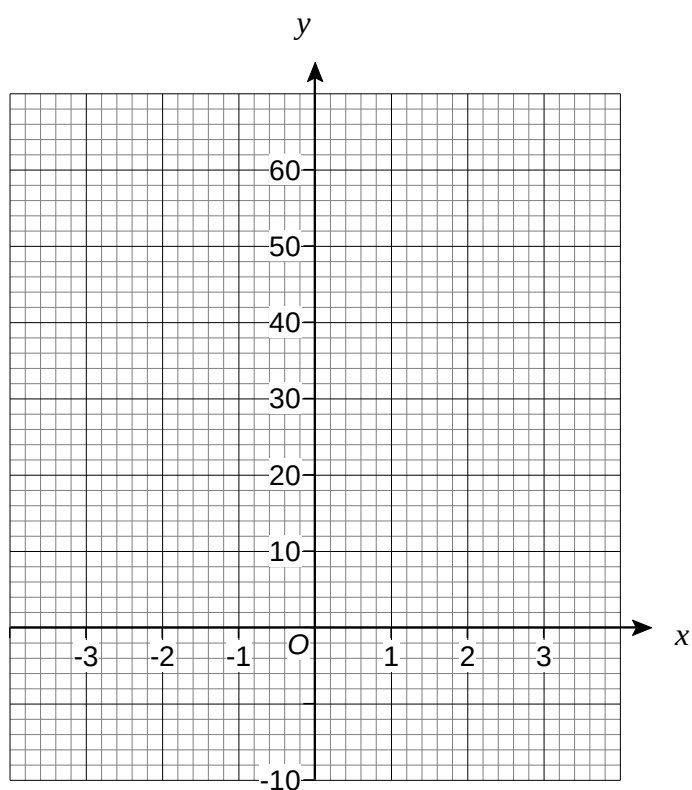
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Answer \_\_\_\_\_ km/h

- 10 (a)** Plot the graph of  $y = 8 \times 2^x$  for values of  $x$  from  $-3$  to  $3$ .  
Use this table to help you.

[3 marks]

|     |      |      |      |     |     |     |      |
|-----|------|------|------|-----|-----|-----|------|
| $x$ | $-3$ | $-2$ | $-1$ | $0$ | $1$ | $2$ | $3$  |
| $y$ | $1$  |      |      | $8$ |     |     | $64$ |



- 10 (b)** Explain what happens to the value of  $y$  when  $x$  is a very large negative number.

[1 mark]

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# Equations – Higher



Sparx  
codes

|                                                  |      |
|--------------------------------------------------|------|
| Substituting into expressions                    | U201 |
| Substituting into algebraic formulae             | U585 |
| Substituting into real-life formulae             | U144 |
| Solving equations with the unknown on both sides | U870 |

- 1 This formula is used to work out the cost, £ $C$ , of tiling a floor with  $n$  tiles.

$$C = 25 + \frac{9n}{2}$$

56 tiles are needed to tile a floor.

Can the floor be tiled for less than £275?

You **must** show your working.

[2 marks]

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- 2 Check if  $-2$  and  $2$  are solutions of the equation  $x^3 = \sqrt{12x + 40}$

You **must** show your working.

[3 marks]

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3

Solve

$$\frac{x}{3} + 2 = \frac{x+1}{2}$$

[3 marks]

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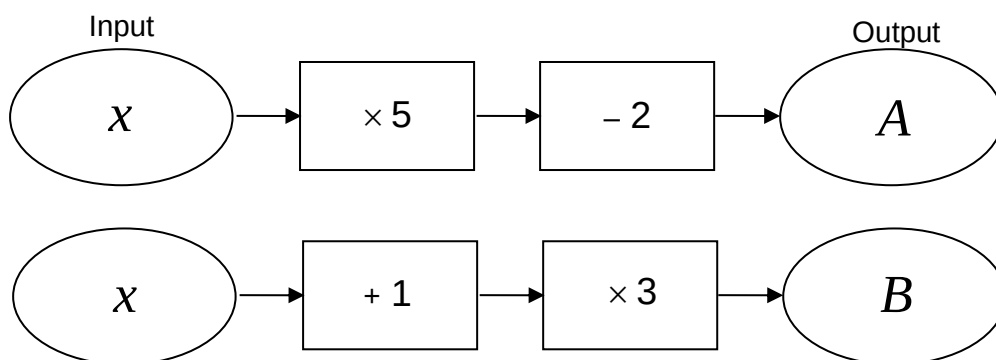


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$x =$  \_\_\_\_\_

4

Here are two number machines.  
Both machines have the same input,  $x$ .



Work out the value of  $x$  when  $A = B$

[4 marks]

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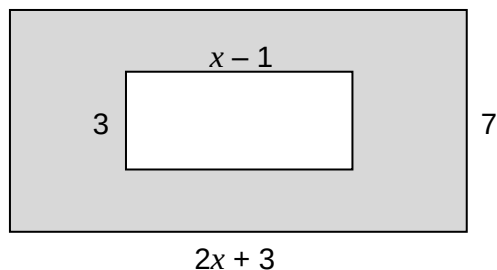
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$x =$  \_\_\_\_\_

- 5** The diagram shows two rectangles.  
All dimensions are in cm



Not drawn  
accurately

The shaded area is  $84.5 \text{ cm}^2$   
Work out the perimeter of the white rectangle.

**[5 marks]**

[illegible]

Answer cm

6 Solve  $\frac{3w-5}{2} = w + 2$

[3 marks]

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$w =$  \_\_\_\_\_



# Algebraic fractions – Higher



Sparx  
codes

|                                                                  |      |
|------------------------------------------------------------------|------|
| Simplifying algebraic fractions by cancelling common factors     | U103 |
| Simplifying algebraic fractions by factorising into one bracket  | U437 |
| Simplifying algebraic fractions by factorising into two brackets | U294 |
| Adding and subtracting algebraic fractions                       | U685 |
| Multiplying algebraic fractions                                  | U457 |
| Dividing algebraic fractions                                     | U824 |

- 1 Add  $\frac{2a}{b} + \frac{3b}{a}$   
Circle your answer.

[1 mark]

$$\frac{6ab}{a+b}$$

$$\frac{2a+3b}{a+b}$$

$$\frac{2a^2+3b^2}{a+b}$$

$$\frac{2a^2+3b^2}{ab}$$

- 2 Subtract  $\frac{3x}{2y} - \frac{5x}{4y}$   
Circle your answer.

[1 mark]

$$-\frac{x}{y}$$

$$\frac{xy}{2}$$

$$\frac{x}{4y}$$

$$-\frac{x}{2y^2}$$

- 3 Simplify fully  $\frac{6de}{15de^2}$   
Circle your answer.

[1 mark]

$$\frac{6e}{15}$$

$$\frac{6}{15e}$$

$$\frac{2e}{5}$$

$$\frac{2}{5e}$$

4 Simplify fully  $\frac{2x}{y^2} \div \frac{x^2}{y}$

Circle your answer.

[1 mark]

$$\frac{2x}{y}$$

$$\frac{2}{xy}$$

$$\frac{2x^3}{y^3}$$

$$\frac{2}{xy^2}$$

5 Simplify fully  $\frac{3x^2}{4y} \div \frac{8y^3}{6x^2}$

[1 mark]

Answer \_\_\_\_\_

6 A class is asked to simplify  $\frac{9x^2 - y^2}{3x - y}$

This is Mya's answer

$$9x^2 \div 3x = 3x$$

$$-y^2 \div -y = +y$$

$$\therefore \frac{9x^2 - y^2}{3x - y} = 3x + y$$

When the teacher read out the answer, Mya ticked her answer as correct.

Was she right to do so? If not explain her mistakes.

[2 marks]

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7 (a) Factorise  $x^2 - 16$

[1 mark]

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Answer \_\_\_\_\_

7 (b) Hence, simplify  $\frac{x^2 - 16}{2x^2 - 5x - 12}$

[3 marks]

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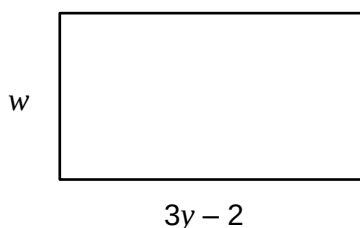
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Answer \_\_\_\_\_

8 The area of this square is  $(3y^2 + y - 2) \text{ cm}^2$



Not drawn  
accurately

Work out an expression for the width  $w$  in terms of  $y$ .

[3 marks]

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Answer \_\_\_\_\_

9  $\frac{ax^2 - b^2}{cx^2 + dx + e}$  simplifies to the expression  $\frac{3x - 2}{4x - 1}$

Work out the values of  $a$ ,  $b$ ,  $c$ ,  $d$  and  $e$ .

[2 marks]

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$a =$  \_\_\_\_\_

$b =$  \_\_\_\_\_

$c =$  \_\_\_\_\_

$d =$  \_\_\_\_\_

$e =$  \_\_\_\_\_

10 Simplify  $\frac{2x^2 - 9x - 5}{6x^2 + 11x + 4}$

[4 marks]

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Answer \_\_\_\_\_

# Quadratics and rearranging formula – Higher



Sparx  
codes

|                                                          |      |
|----------------------------------------------------------|------|
| Simplifying expressions using index laws                 | U662 |
| Expanding double brackets                                | U768 |
| Changing the subjects of formulae                        | U556 |
| Factorising quadratic expressions of the form $x^2+bx+c$ | U178 |
| Constructing and solving equations                       | U599 |

1 (a) Write  $\frac{x^3 \times x^5}{x^2}$  as a single power of  $x$ .

[1 mark]

Answer \_\_\_\_\_

1 (b) Write  $\frac{3y^{-2} \times 8y^5}{6y^{-5} \times y^2}$  as a single power of  $y$  with a numerical coefficient.

[2 marks]

Answer \_\_\_\_\_

2 Expand and simplify  $(x - 5)(x + 2)$

[2 marks]

Answer \_\_\_\_\_

**3** Rearrange  $P = 2w + 2l$  to make  $w$  the subject.

**[2 marks]**

Answer \_\_\_\_\_

**4 (a)** Factorise

$$x^2 - 36$$

**[1 mark]**

Answer \_\_\_\_\_

**4 (b)** Factorise fully

$$9y^2 - 16$$

**[2 marks]**

Answer \_\_\_\_\_

**5** Simplify fully

$$\frac{6a + 2b + 3a - 8b}{10a - 3b + 5a - 7b}$$

**[2 marks]**

Answer \_\_\_\_\_

6 Factorise

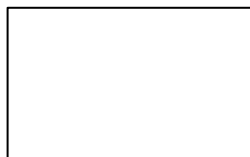
$$x^2 + 5x - 14$$

[2 marks]

Answer \_\_\_\_\_

- 7 Here is a rectangle.  
The length is  $3x - 1$  cm  
The perimeter is  $10x$  cm

$(3x - 1)$  cm



Not drawn  
accurately

Work out an expression for the area in the form  $ax^2 + bx + c$

[3 marks]

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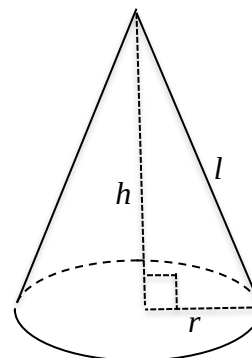
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Answer \_\_\_\_\_

**8** The curved surface area of a cone is given by  $A = \pi r l$

The volume of a cone is given by  $V = \frac{1}{3} \pi r^2 h$

Where  $l$  is the slant height,  $h$  is the perpendicular height and  $r$  is the radius.



**8 (a)** Rearrange the area formula to make  $r$  the subject.

[1 mark]

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Answer \_\_\_\_\_

**8 (b)** Write down a formula that connects  $l$ ,  $h$  and  $r$ .

[1 mark]

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Answer \_\_\_\_\_

**8 (c)** Work out the volume formula in terms of  $\pi$ ,  $l$  and  $r$  only.

[1 mark]

---

Answer \_\_\_\_\_



# Functions, quadratics, identities and rearranging formula – Higher



Sparx  
codes

|                                                           |      |
|-----------------------------------------------------------|------|
| Finding composite functions                               | U448 |
| Finding inverse functions                                 | U996 |
| Expanding triple brackets                                 | U606 |
| Factorising quadratic expressions of the form $ax^2+bx+c$ | U858 |
| Changing the subjects of formulae                         | U556 |

1  $f(x) = 2x + 3$  and  $g(x) = x^2$

1 (a) Circle the expression that represents  $f^{-1}(x)$

[1 mark]

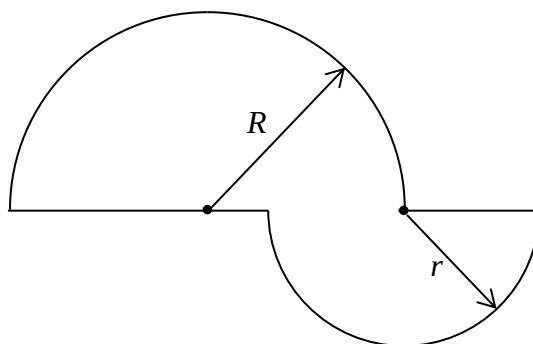
$2(x - 3)$ 
 $\frac{x + 3}{2}$ 
 $\frac{x - 3}{2}$ 
 $3x + 2$

1 (b) Circle the expression that represents  $fg(x)$

[1 mark]

$(2x + 3)^2$ 
 $2x^2 + 3$ 
 $(2x)^2 + 3$ 
 $2x + 3^2$

2 A shape is made from a large semicircle, radius  $R$ , and a small semicircle, radius  $r$ , joined as shown.



Work out an expression for the perimeter of the shape.

[2 marks]

Answer \_\_\_\_\_

3 Simplify  $(3x^2y)^3$

[2 marks]

---

Answer \_\_\_\_\_

4 Expand  $(x - 5)(2x + 1)(3x + 2)$

[3 marks]

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Answer \_\_\_\_\_

5 Which **one** of the following has been wrongly written as an identity?  
Circle your answer

[1 mark]

$$(x + a)(x - a) \equiv x^2 - a^2$$

$$(w + a)^2 \equiv w^2 + 2aw + a^2$$

$$(p - a)^2 \equiv p^2 - 2ap - a^2$$

$$y(y + a) \equiv y^2 + ay$$

**6** Factorise fully  $18a^2 - 32$

**[2 marks]**

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Answer \_\_\_\_\_

**7** Factorise  $12x^2 - 5x - 3$

**[2 marks]**

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Answer \_\_\_\_\_

**8** Rearrange  $y = \frac{2x - 1}{4x + 5}$  to make  $x$  the subject.

**[3 marks]**

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Answer \_\_\_\_\_

9 The algebraic fraction  $\frac{ax^2 + bx + c}{dx^2 - 4}$  will simplify to  $\frac{2x + 3}{3x + 2}$

Work out the values of  $a$ ,  $b$ ,  $c$  and  $d$ .

[3 marks]

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$a =$  \_\_\_\_\_

$b =$  \_\_\_\_\_

$c =$  \_\_\_\_\_

$d =$  \_\_\_\_\_

# Linear and quadratic equations and their graphs – Higher

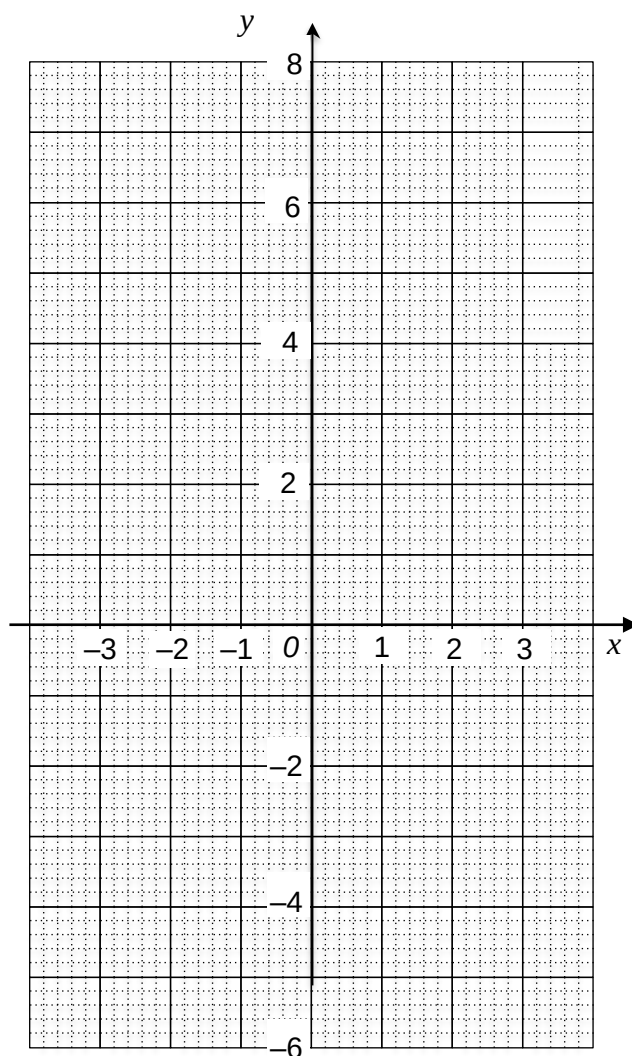


Sparx  
codes

|                                                                         |      |
|-------------------------------------------------------------------------|------|
| Plotting straight line graphs                                           | U741 |
| Plotting graphs of quadratic functions                                  | U989 |
| Interpreting graphs of quadratic functions                              | U667 |
| Finding the turning point of a quadratic graph by completing the square | U769 |
| Constructing and solving quadratic equations                            | U150 |

**1 (a)** Draw the graph of  $y = 2x + 1$  for values of  $x$  from  $-3$  to  $3$

[2 marks]



**1 (b)** Show clearly how you can use the graph to solve the equation

$$2x + 1 = 4$$

[1 mark]

2 Solve  $\frac{2x+1}{3} + 4 = 4(x-1)$

[3 marks]

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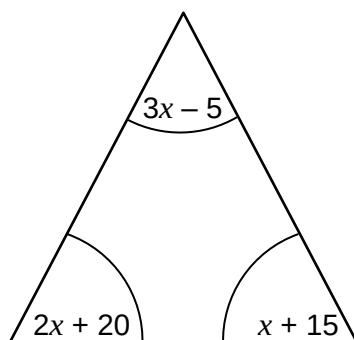
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$x =$  \_\_\_\_\_

3 Show that this triangle is isosceles.

[4 marks]



Not drawn  
accurately

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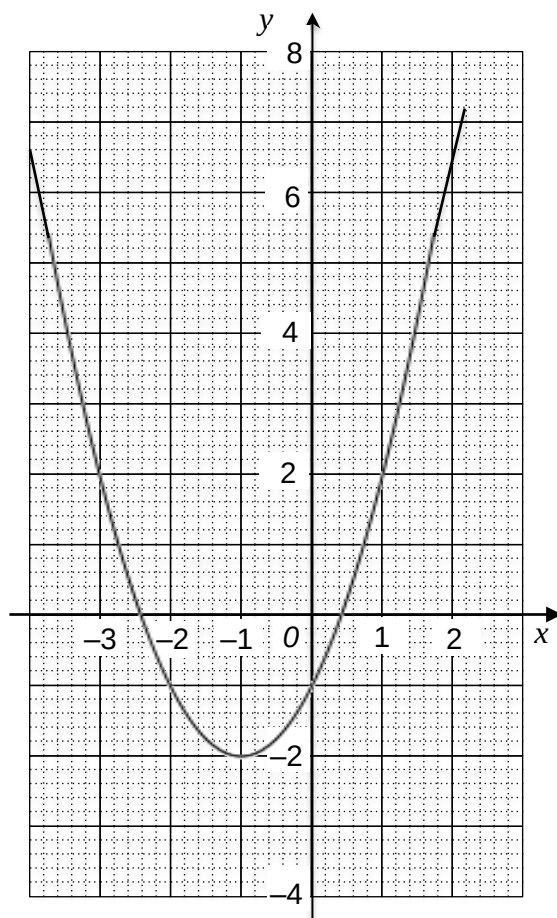
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4 Here is the graph of  $y = x^2 + 2x - 1$  for values of  $x$  from  $-3$  to  $2$



From the graph write down the coordinates of the following

[3 marks]

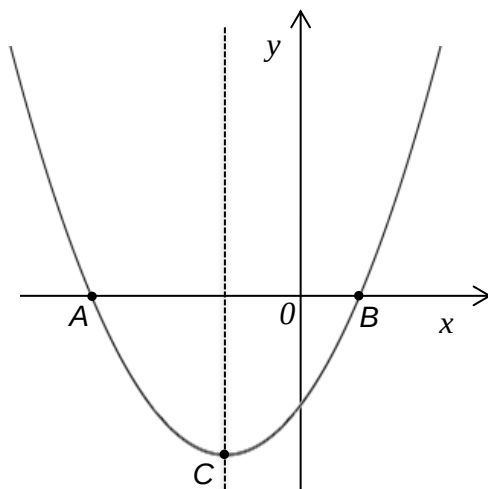
The  $y$ -intercept ( \_\_\_\_\_ , \_\_\_\_\_ )

The turning point ( \_\_\_\_\_ , \_\_\_\_\_ )

The negative root of  $x^2 + 2x - 1 = 0$  ( \_\_\_\_\_ , \_\_\_\_\_ )

The positive root of  $x^2 + 2x - 1 = 0$  ( \_\_\_\_\_ , \_\_\_\_\_ )

5 Here is a sketch of the graph  $y = (x - 1)(x + 4)$



5 (a) Write down the coordinates of the point A and B.

[1 mark]

Answer (        ), (        ) and (        ), (        )

5 (b) Work out the coordinates of the point C.

[1 mark]

Answer \_\_\_\_\_



**6 (a)** Write the equation  $x^2 + 6x - 5 = 0$  in the form  $(x + a)^2 - b = 0$

**[2 marks]**

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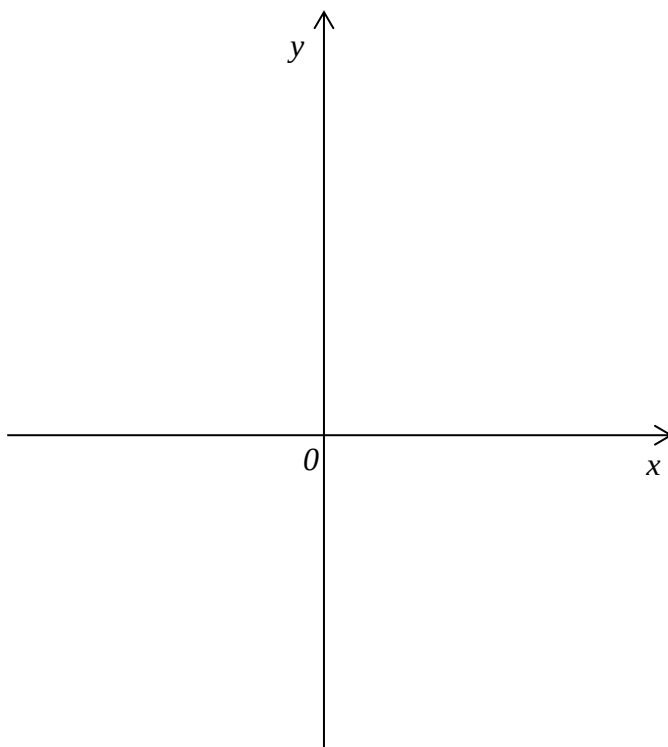
Answer \_\_\_\_\_

**6 (b)** Sketch the graph of  $y = x^2 + 6x - 5$  on the axes.

Clearly mark the exact value of the points where the graph crosses the axes and the coordinates of the minimum point.

Use surds where necessary.

**[3 marks]**



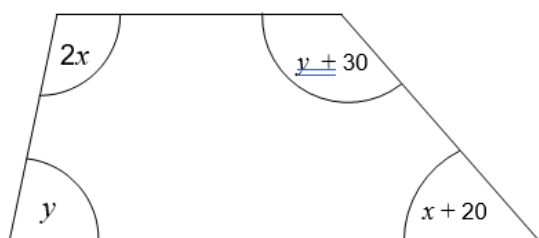
# Simultaneous equations – Higher



Sparx  
codes

|                                                        |      |
|--------------------------------------------------------|------|
| Solving simultaneous equations using elimination       | U760 |
| Solving simultaneous equations using substitution      | U757 |
| Constructing and solving linear simultaneous equations | U137 |

1 Here is a trapezium.



Not drawn  
accurately

Which **two** of these equations are true?  
Circle your answers.

[1 mark]

$$2x + y = 180$$

$$x + y = 160$$

$$x + y = 130$$

$$2x + y = 150$$

2 Solve the simultaneous equations.

$$\begin{aligned} 2x + y &= 13 \\ x + 2y &= 17 \end{aligned}$$

Do **not** use trial and improvement.

[3 marks]

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 $x =$  \_\_\_\_\_  
 $y =$  \_\_\_\_\_

- 3 A tea and a two buns costs £3.00  
Two teas and three buns costs £5.10

Work out the cost of two teas and a bun.

[3 marks]

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Answer £

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- 4 The cost of one CD and one DVD is £22  
A DVD is £4 more expensive than a CD.

Work out the cost of a CD and a DVD.

[4 marks]

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CD = £

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DVD = £

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- 5 Solve the simultaneous equations.

$$\begin{aligned} 2x + 3y &= 70 \\ 3x + 2y &= 130 \end{aligned}$$

Do **not** use trial and improvement.

[4 marks]

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x =

---

y =

---

6 Solve the simultaneous equations.

$$\begin{aligned} y &= x^2 + x - 3 \\ y &= 2x + 3 \end{aligned}$$

[5 marks]

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 $x =$  

---

  
 $y =$  

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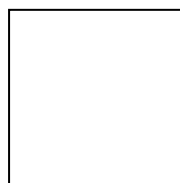
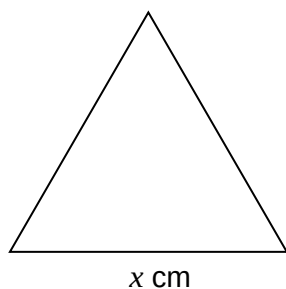
# Perimeter and area – Higher



Sparx  
codes

|                                                                                |      |
|--------------------------------------------------------------------------------|------|
| Finding the perimeter of compound shapes                                       | U351 |
| Problem solving: Area and perimeter of rectangles and compound shapes (Higher) | U934 |
| Finding the area of compound shapes containing triangles                       | U575 |
| Finding the area of parallelograms                                             | U424 |
| Finding the area of trapeziums                                                 | U265 |
| Problem solving: Area of triangles, parallelograms and trapeziums (Higher)     | U904 |

- 1 The diagram shows an equilateral triangle and a square.  
Each side of the square is 1.5 cm shorter than each side of the triangle.



Not drawn  
accurately

The perimeter of the triangle is equal to the perimeter of the square.

Work out the value of  $x$ .

[3 marks]

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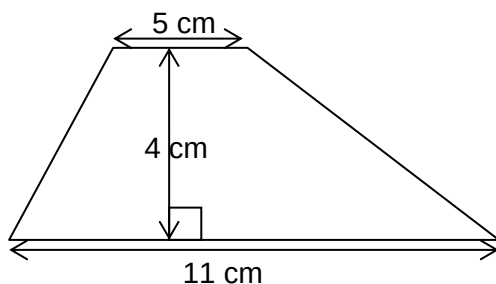
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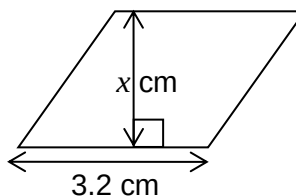
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Answer \_\_\_\_\_ cm

2



Not drawn  
accurately



The area of the trapezium is four times the area of the parallelogram.

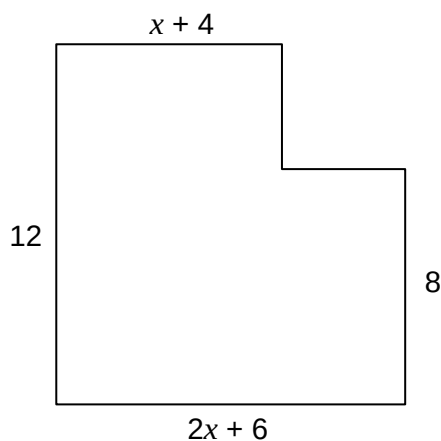
Work out the value of  $x$ .

**[3 marks]**

[illegible]

Answer

- 3 This shape is made from rectangles.  
All measurements are in cm



Not drawn  
accurately

Work out an expression, in terms of  $x$ , for the area of the shape.  
Give your answer in its simplest form.

[3 marks]

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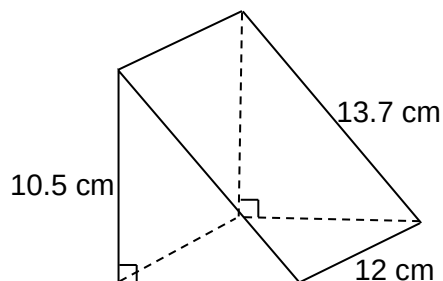
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Answer \_\_\_\_\_  $\text{cm}^2$

- 4 The diagram shows a piece of cheese in the shape of a triangular prism.



Not drawn  
accurately

- 4 (a) Work out the area of cling film needed to cover the cheese.

[5 marks]

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Answer \_\_\_\_\_  $\text{cm}^2$

- 4 (b) Is your answer likely to be accurate for the area of cling film used?

Give a reason for your decision.

[1 mark]

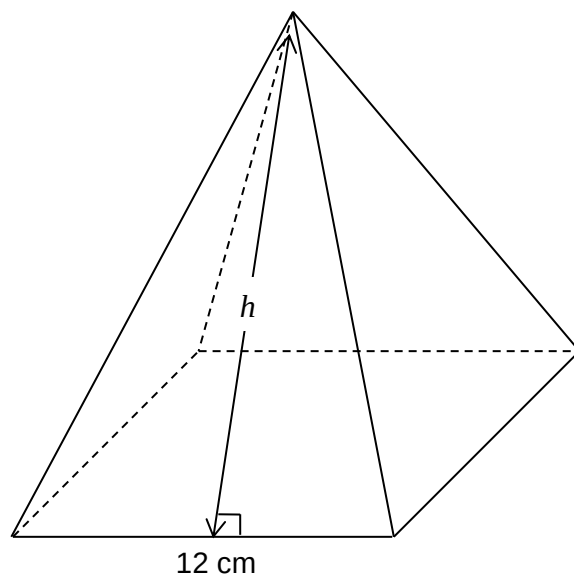
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Answer \_\_\_\_\_



- 5 The apex of this pyramid is directly above the centre of the square base.  
The total surface area is  $504 \text{ cm}^2$



Not drawn  
accurately

Work out the perpendicular height,  $h$  of one of the triangular faces.

[3 marks]

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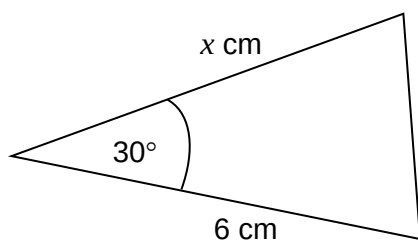
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Answer \_\_\_\_\_  $\text{cm}^2$

6 The area of the triangle is  $15 \text{ cm}^2$



Not drawn  
accurately

Work the value of  $x$ .

[2 marks]

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Answer \_\_\_\_\_ cm

# Circumference and area – Higher



Sparx  
codes

Finding the circumference of circles

U604

Finding the area of circles

U950

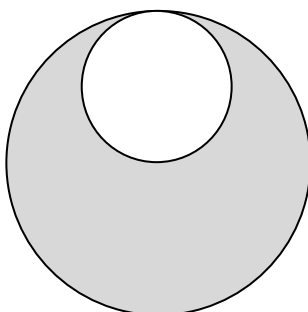
Finding the arc length of sectors

U221

Finding the area of sectors

U373

- 1 This shape is made from circles.  
The diameter of the larger circle is twice the diameter of the smaller circle.



Not drawn  
accurately

What fraction of the shape is shaded?  
Give your answer in its simplest form.

[4 marks]

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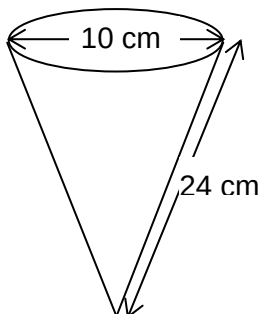
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Answer \_\_\_\_\_

**2** The diagram shows a solid cone.



Not drawn accurately

You are given that      curved surface area of a cone =  $\pi \times \text{radius} \times \text{slant height}$

Work out the **total** surface area of the cone.

**[4 marks]**

[illegible]

Answer \_\_\_\_\_  $\text{cm}^2$

- 3 The surface area of a marble is  $4.5 \text{ cm}^2$

You are given that surface area of a sphere =  $4\pi \times \text{radius}^2$

Work out the radius of the marble.

[3 marks]

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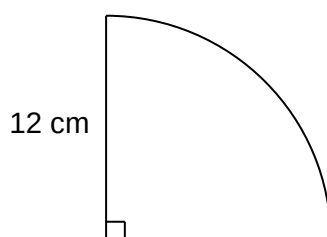
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Answer \_\_\_\_\_ cm

- 4 The diagram shows a quarter circle of radius 12 cm



Circle the expression for the perimeter of the shape, in cm

[1 mark]

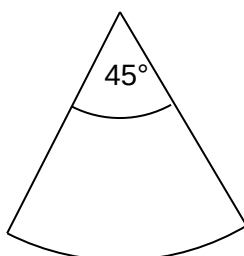
$6\pi + 12$

$6\pi + 24$

$24\pi + 12$

$24\pi + 24$

5 The diagram shows a sector of a circle.



Not drawn  
accurately

The arc length is 18 cm

Work out the radius.

[3 marks]

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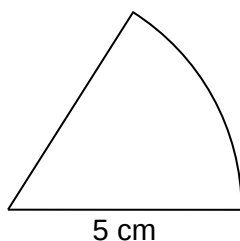
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Answer \_\_\_\_\_ cm

- 6 The diagram shows a sector of a circle of radius 5 cm



Not drawn  
accurately

The area of the sector is  $5\pi \text{ cm}^2$

Work out the arc length.

Give your answer in terms of  $\pi$ .

[5 marks]

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Answer \_\_\_\_\_ cm

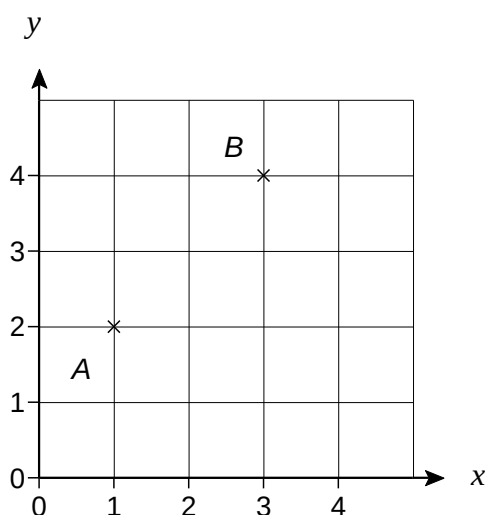
# Geometry and measure – Higher



Sparx  
codes

|                                                         |      |
|---------------------------------------------------------|------|
| Translation                                             | U196 |
| Enlargement by a positive scale factor                  | U519 |
| Enlargement by a positive or negative scale factor      | U134 |
| Finding the volume of cones                             | U116 |
| Finding the volume of spheres                           | U617 |
| Mixed problems: Finding the volume of cones and spheres | U426 |

Use this grid to answer questions 1 to 3



- 1  $ABC$  is an isosceles triangle.  
Circle the coordinates of  $C$ .

[1 mark]

(1, 4)      (3, 0)      (4, 2)      (0, 4)

- 2 Point  $B$  is translated by the vector  $\begin{pmatrix} -2 \\ -1 \end{pmatrix}$  to the point  $D$ .

What are the coordinates of  $D$ ?

Circle your answer.

[1 mark]

(1, 4)      (1, 3)      (4, 1)      (3, 1)



- 3 Point  $A$  is reflected through the line  $y = x$  to the point  $E$ .

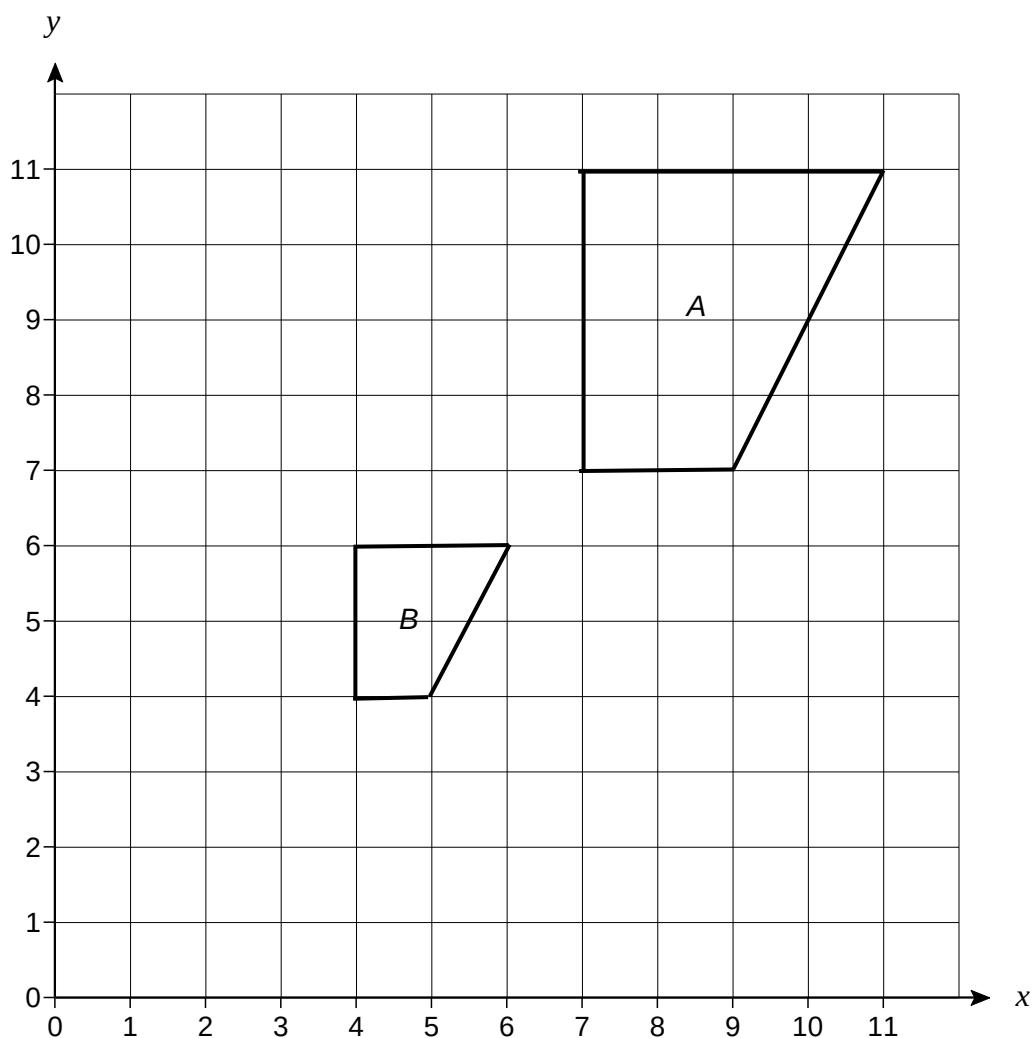
What are the coordinates of  $E$ ?  
Circle your answer.

[1 mark]

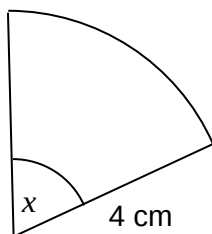
(1, 1)      (3, 2)      (2, 3)      (2, 1)

- 4 Describe the single transformation that maps shape  $A$  onto shape  $B$ .

[3 marks]



- 5 The diagram shows a sector of a circle of radius 4 cm



Not drawn  
accurately

The perimeter of the sector is 12 cm

Work out the size of angle  $x$ .

[3 marks]

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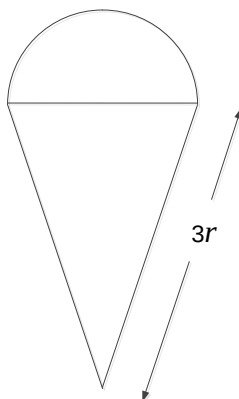
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Answer \_\_\_\_\_ degrees

**6** A hemisphere of radius  $r$  is joined to a cone of the same radius.



The slant height of the cone is  $3r$ .

Show that the combined volume is  $\frac{2}{3}\pi r^3(\sqrt{2}+1)$

**[5 marks]**

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- 7 A large spring has a diameter of 15 cm  
It is made from 20 loops of steel cable.



Steel cable costs £3.60 per metre.

How many springs can be made for £1000?

[4 marks]

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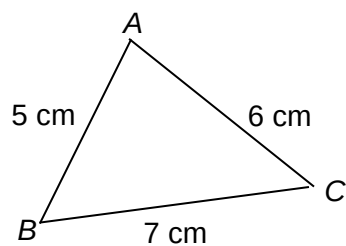
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Answer £ \_\_\_\_\_

8

Not drawn  
accurately

Is angle A acute or obtuse?

You **must** show your working.**[2 marks]**

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Answer \_\_\_\_\_

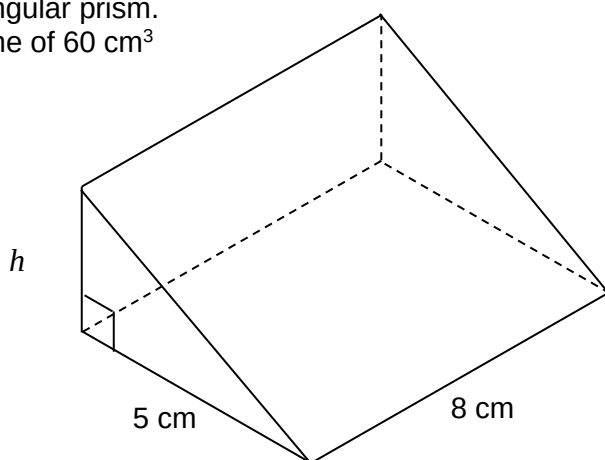
# Volume – Higher



Sparx  
codes

|                                                         |      |
|---------------------------------------------------------|------|
| Finding the volume of cubes and cuboids                 | U786 |
| Finding the volume of prisms                            | U174 |
| Finding the volume of cones                             | U116 |
| Finding the volume of spheres                           | U617 |
| Mixed problems: Finding the volume of cones and spheres | U426 |
| Finding the volume of composite shapes                  | U543 |

- 1 Here is a triangular prism.  
It has a volume of  $60 \text{ cm}^3$



Work out the height,  $h$ .

[3 marks]

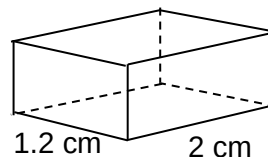
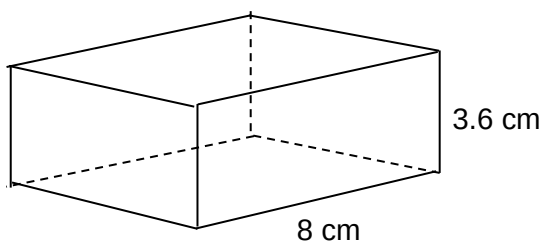
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Answer \_\_\_\_\_ cm

2 These two cuboids are similar in shape.



2 (a) How many small cuboids will fill the large cuboid?

[2 marks]

\_\_\_\_\_

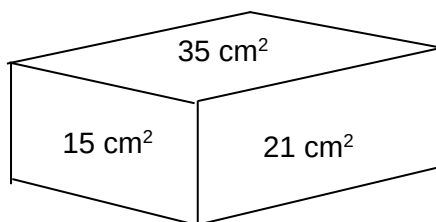
Answer \_\_\_\_\_

2 (b) Which information, given on the diagrams, is **not** necessary to answer part (a).  
Give a reason to support your answer,

[2 marks]

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3 Here is a cuboid.  
The **areas** of the top and two sides are shown.



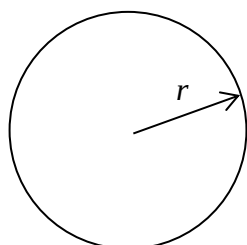
Work out the volume of the cuboid.

[3 marks]

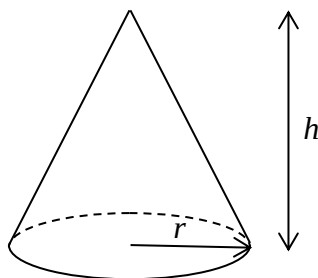
\_\_\_\_\_  
\_\_\_\_\_

Answer \_\_\_\_\_  $\text{cm}^3$

- 4 Here are a sphere and a cone.  
The formulas for their volumes are shown.  
The radius of the sphere and the radius of the base of the cone are both  $r$ .



$$\text{Volume} = \frac{4}{3}\pi r^3$$



$$\text{Volume} = \frac{1}{3}\pi r^2 h$$

The volume of the cone is half of the volume of the sphere.  
Work out the height of the cone in terms of  $r$ .

[2 marks]

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Answer \_\_\_\_\_

- 5 The surface areas of two similar shapes are in the ratio 4 : 9  
Work out the ratio of their volumes.

[1 mark]

---

Answer \_\_\_\_\_

- 6  $a$ ,  $b$  and  $c$  are lengths.  
Which of the following is not a measure of volume?  
Circle your answer.

[1 mark]

$$\frac{4}{3}\pi a^3$$

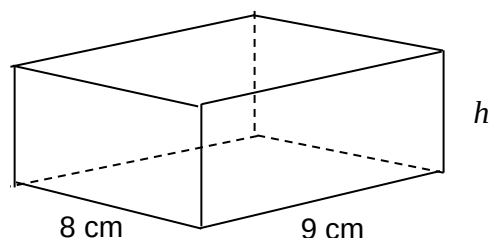
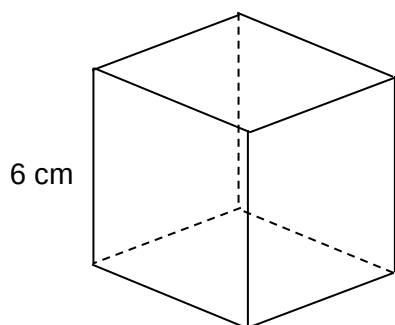
$$abc$$

$$2(ab + bc + ac)$$

$$(a + b) \times c^2$$



- 7 Here are a cube and a cuboid.  
They have the same volume.



Work out the height,  $h$ , of the cuboid.

[2 marks]

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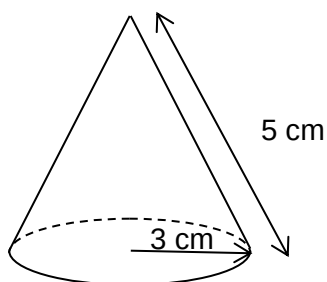


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Answer \_\_\_\_\_ cm

- 8 Work out the volume of this cone.  
Give your answer in terms of  $\pi$

$$\text{Volume} = \frac{1}{3} \pi r^2 h$$



[2 marks]

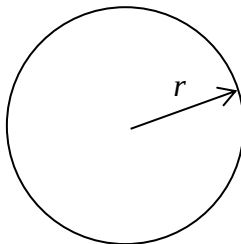
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Answer \_\_\_\_\_  $\text{cm}^3$

9 Here is a sphere



$$\text{Volume} = \frac{4}{3}\pi r^3$$

The volume of the sphere is  $36\pi \text{ cm}^3$

Work out the value of  $r$ .

[2 marks]

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Answer \_\_\_\_\_

# Pythagoras' Theorem and basic trigonometry – Higher



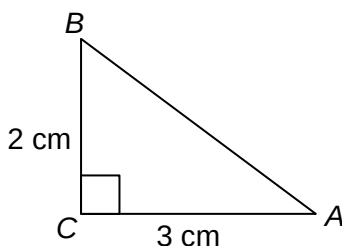
Sparx  
codes

|                                                         |      |
|---------------------------------------------------------|------|
| Using Pythagoras' theorem in 2D                         | U385 |
| Understanding sin, cos and tan                          | U605 |
| Finding unknown sides in right-angled triangles         | U283 |
| Finding unknown angles in right-angled triangles        | U545 |
| Using the exact values of trigonometric ratios          | U627 |
| Using the exact values of trigonometric ratios (Higher) | U319 |
| Angles of elevation and depression                      | U967 |

## Section A

Calculator. 15 minutes.

- 1 What is the value of  $\sin A$  for this triangle?



Not drawn  
accurately

Circle your answer.

[1 mark]

$$\frac{2}{3}$$

$$\frac{2}{5}$$

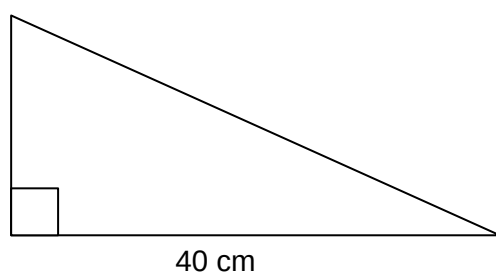
$$\frac{2}{\sqrt{13}}$$

$$\frac{3}{\sqrt{13}}$$

- 2 The area of this triangle is  $180 \text{ cm}^2$

Work out the length of the perimeter.  
You **must** show your working.

[4 marks]



Not drawn  
accurately

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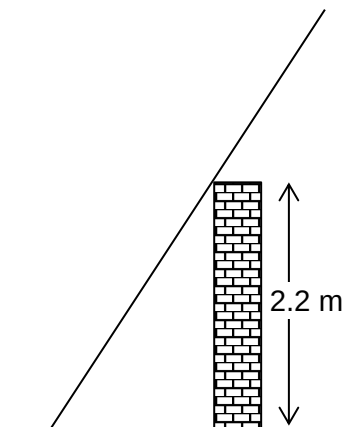
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Answer \_\_\_\_\_

- 3 A ladder of length 5 metres leans against a wall that is 2.2 metres high. The midpoint of the ladder is in contact with the top of the wall. Safety guidelines state that for a wall 2.2 metres high the base of a ladder should be between 0.8 and 0.9 metres from the base of the wall.

Is the ladder safe?

[2 marks]



Not drawn accurately

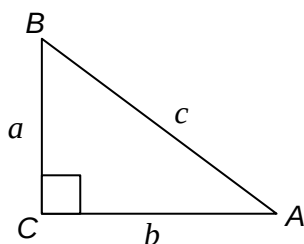
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- 4 For this triangle, which of the following is **not** true?

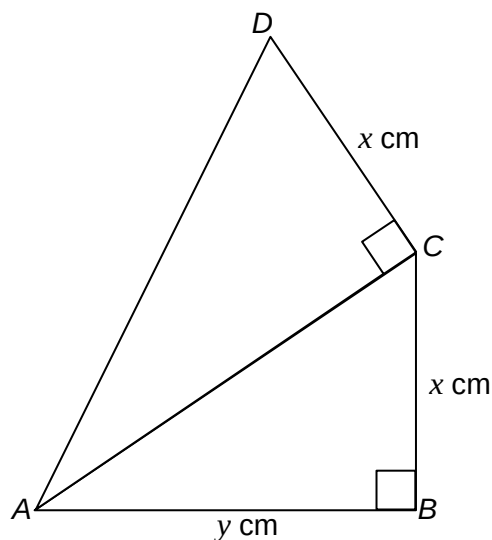


Circle your answer.

[1 mark]

$$a = \sqrt{c^2 - b^2} \quad \sin C = 1 \quad \sin A = \cos B \quad \tan A = \frac{b}{a}$$

- 5  $ABC$  and  $ACD$  are right angled triangles.  
 $BC = CD = x$  cm  
 $AB = y$  cm



Not drawn  
accurately

- 5 (a) Work out an expression for  $AD$  in terms of  $x$  and  $y$ .

[3 marks]

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Answer \_\_\_\_\_

- 5 (b) You are given that  $\tan DAC = \frac{1}{3}$ .

Show that angle  $CAB$  is approximately  $19.5^\circ$

[4 marks]

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## Section B

Non-calculator. 5 minutes. Put your calculator away. You may work on part A but you must not use your calculator.

- 6 Which of the following is true?  
Circle your answer.

[1 mark]

$$\tan 30 = \frac{1}{\sqrt{3}}$$

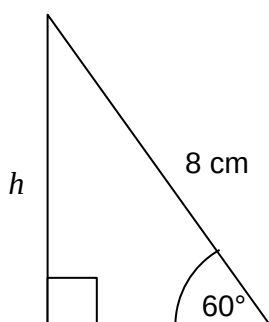
$$\sin 45 = \frac{2}{\sqrt{2}}$$

$$\cos 60 = \frac{\sqrt{3}}{2}$$

$$\tan 60 = 2$$

- 7 Work out the height,  $h$ , of this triangle.  
Give your answer in surd form.

[2 marks]



Not drawn  
accurately

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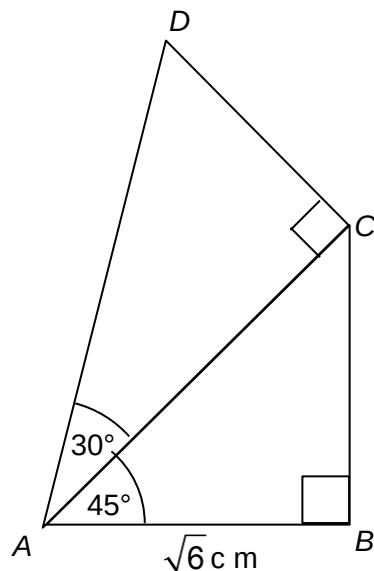
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Answer \_\_\_\_\_ cm

- 8  $ABC$  and  $ACD$  are two right-angled triangles.

Show that  $CD = 2$  cm

[2 marks]



Not drawn  
accurately

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Answer \_\_\_\_\_ cm



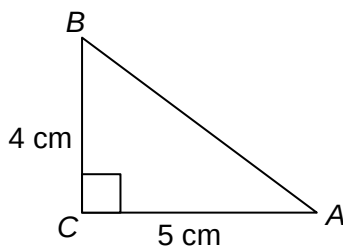
# Trigonometry – Higher



Sparx  
codes

|                                                         |      |
|---------------------------------------------------------|------|
| Understanding sin, cos and tan                          | U605 |
| Finding unknown sides in right-angled triangles         | U283 |
| Finding unknown angles in right-angled triangles        | U545 |
| Using the exact values of trigonometric ratios (Higher) | U319 |
| Angles of elevation and depression                      | U967 |
| Trigonometry in 3D shapes                               | U170 |
| Calculating with trigonometry and bearings              | U164 |

- 1 What is the value of  $\sin A$  for this triangle?



Not drawn  
accurately

Circle your answer.

[1 mark]

$$\frac{4}{5}$$

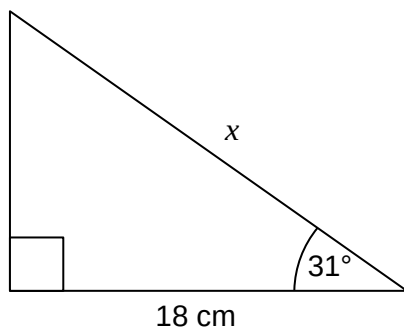
$$\frac{4}{\sqrt{41}}$$

$$\frac{4}{9}$$

$$\frac{5}{\sqrt{41}}$$

2 Work out the length  $x$ .

[2 marks]



Not drawn  
accurately

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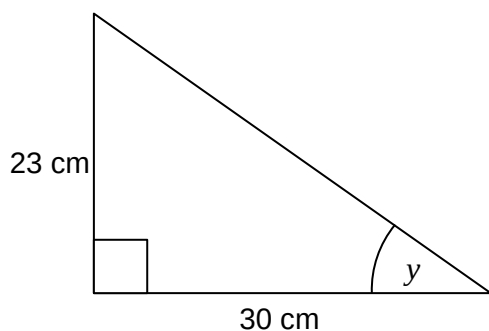


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Answer \_\_\_\_\_ cm

3 Work out the size of angle  $y$ .

[2 marks]



Not drawn  
accurately

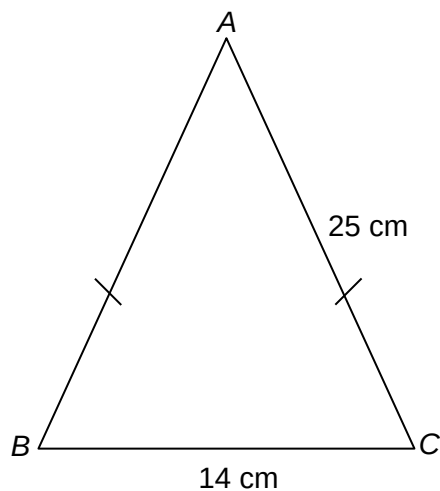
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Answer \_\_\_\_\_ degrees

4  $AB = AC$



Not drawn  
accurately

Work out the area of triangle  $ABC$ .

[4 marks]

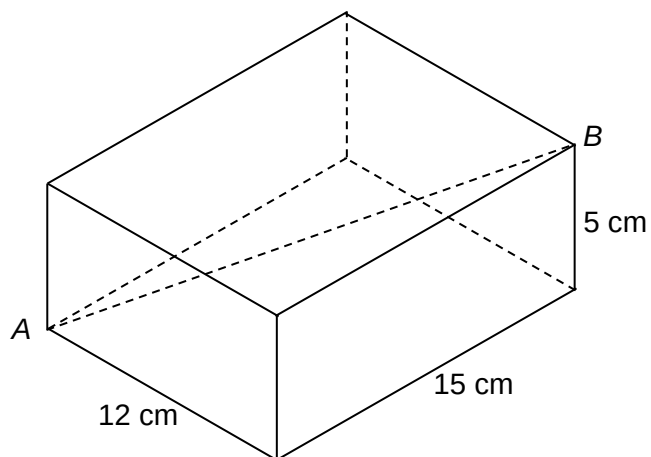
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Answer \_\_\_\_\_  $\text{cm}^2$

5 Work out the length of the diagonal  $AB$  of a cuboid with dimensions 5 cm, 12 cm and 15 cm



[3 marks]

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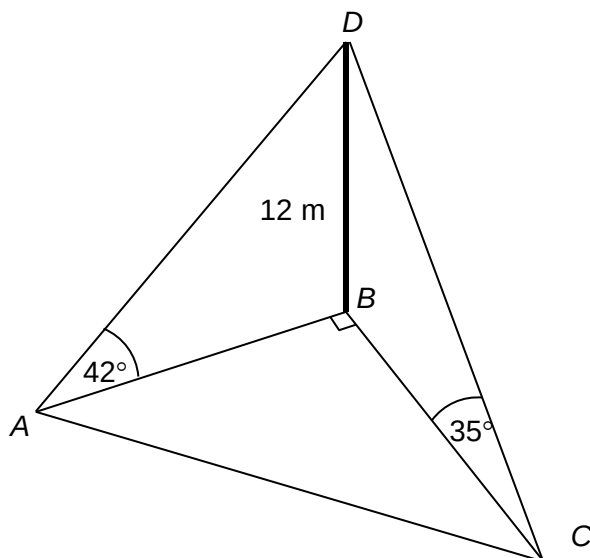
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Answer \_\_\_\_\_ cm

- 6  $ABC$  is a right-angled triangle on level ground.  
 $DB$  is a vertical mast of height 12 metres.

The angle of elevation from  $A$  to  $D$  is  $42^\circ$   
The angle of elevation from  $C$  to  $D$  is  $35^\circ$



Work out the distance  $AC$ .

[5 marks]

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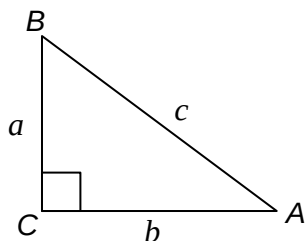
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Answer \_\_\_\_\_ m

7 ABC is a right-angled triangle.



Use trigonometry and Pythagoras' theorem to show that

$$\sin^2 A + \cos^2 A = 1$$

Note that  $\sin^2 A$  is the mathematical way of writing  $(\sin A)^2$

[3 marks]

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# Sine and Cosine Rule – Higher



Sparx  
codes

The sine rule

U952

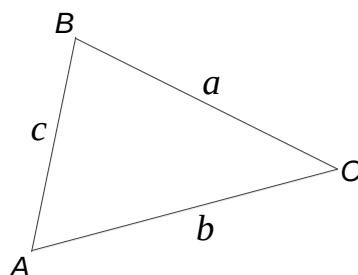
The cosine rule

U591

The area rule

U592

Use this diagram to answer questions 1 to 3.



- 1 Which one of these formulas is correct?  
Circle your answer.

[1 mark]

$$\frac{a}{\sin A} = \frac{\sin B}{b}$$

$$ab = (\sin C)^2$$

$$\frac{a}{\sin A} = \frac{\sin C}{\sin B}$$

$$\frac{a}{b} = \frac{\sin A}{\sin B}$$

- 2 Which one of these formulas is correct?  
Circle your answer.

[1 mark]

$$a^2 = b^2 + c^2 + 2bc \cos A \quad a^2 = b^2 + c^2 + 2ac \cos A$$

$$a^2 = b^2 + c^2 - 2bc \cos A \quad a^2 = b^2 + c^2 - 2ac \cos A$$

- 3 Which one of these gives the area of the triangle?  
Circle your answer.

[1 mark]

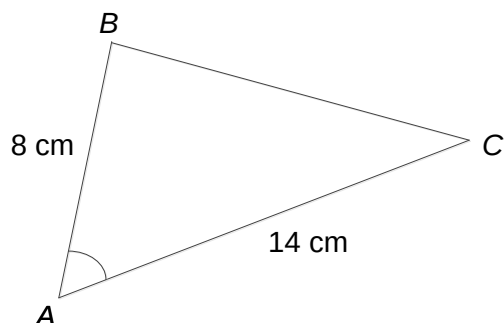
$$\frac{1}{2}bc \sin A$$

$$\frac{1}{2}ac \sin A$$

$$\frac{1}{2}ab \sin A$$

$$\frac{1}{2}abc \sin A$$

- 4 The area of this triangle is  $28 \text{ cm}^2$



Not drawn  
accurately

Work out the size of angle A.

$x$

[2 marks]

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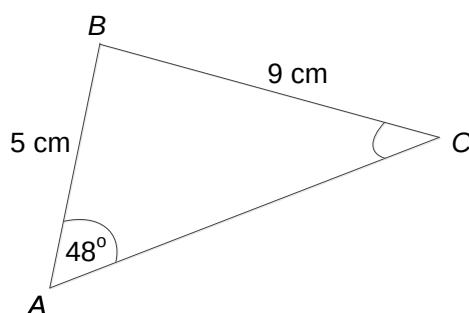
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Answer \_\_\_\_\_ degrees

- 5 Work out the size of angle C.



Not drawn  
accurately

[3 marks]

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Answer \_\_\_\_\_ degrees



6 You are given that  $\sin 60^\circ - \sin 45^\circ = \frac{1}{2}(\sqrt{a} - \sqrt{b})$

Work out the values of the integers  $a$  and  $b$ .

[4 marks]

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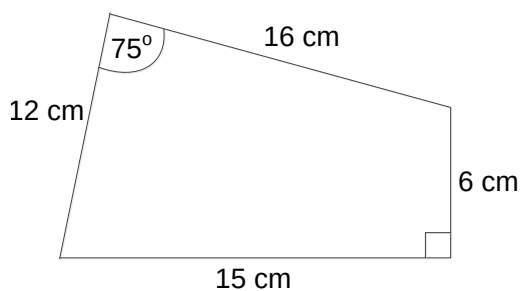
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$a =$  \_\_\_\_\_

$b =$  \_\_\_\_\_

7 Work out the area of this quadrilateral.



Not drawn  
accurately

[4 marks]

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Answer \_\_\_\_\_  $\text{cm}^2$

- 8** Two soldiers *A* and *B* leave the same base.  
Soldier *A* travels 5 km due North.  
Soldier *B* travels 6 km due South-East.

How far apart are the soldiers?

**[4 marks]**

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Answer \_\_\_\_\_ km

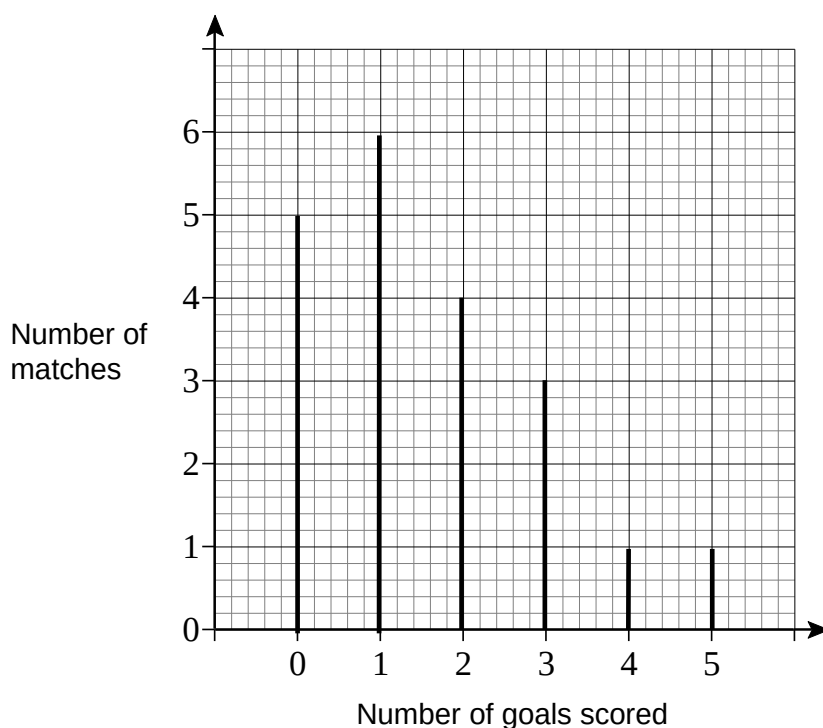
# Collecting and representing data – Higher



Sparx  
codes

|                                              |      |
|----------------------------------------------|------|
| Drawing cumulative frequency graphs          | U182 |
| Interpreting cumulative frequency graphs     | U642 |
| Drawing histograms with equal class widths   | U185 |
| Drawing histograms with unequal class widths | U814 |
| Drawing pie charts                           | U508 |
| Interpreting pie charts                      | U172 |

- 1 The diagram shows the number of goals scored by a team with their old manager.



The team had a new manager for the last few matches of the season.  
They scored 40 goals over the whole season of 24 matches.

How many goals per match did they score on average with the new manager?

[4 marks]

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Answer \_\_\_\_\_

2 Jess measures the height of each student in her year.

2 (a) Which **two** words describe the data she collects?

Circle your answers.

[2 marks]

Primary

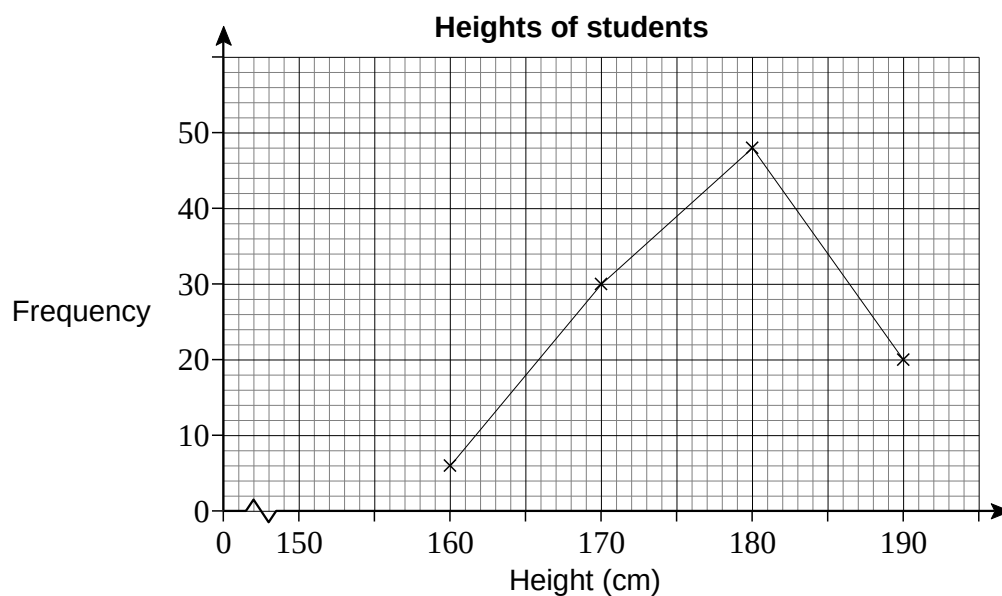
Secondary

Discrete

Continuous

2 (b) Jess records the data in this table and draws a frequency polygon.

| Height, $h$ (cm)   | Frequency |
|--------------------|-----------|
| $150 \leq h < 160$ | 6         |
| $160 \leq h < 170$ | 30        |
| $170 \leq h < 180$ | 44        |
| $180 \leq h < 190$ | 20        |



Write down two mistakes that she has made.

[2 marks]

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- 3 The table shows information about the distances travelled to make 500 deliveries.

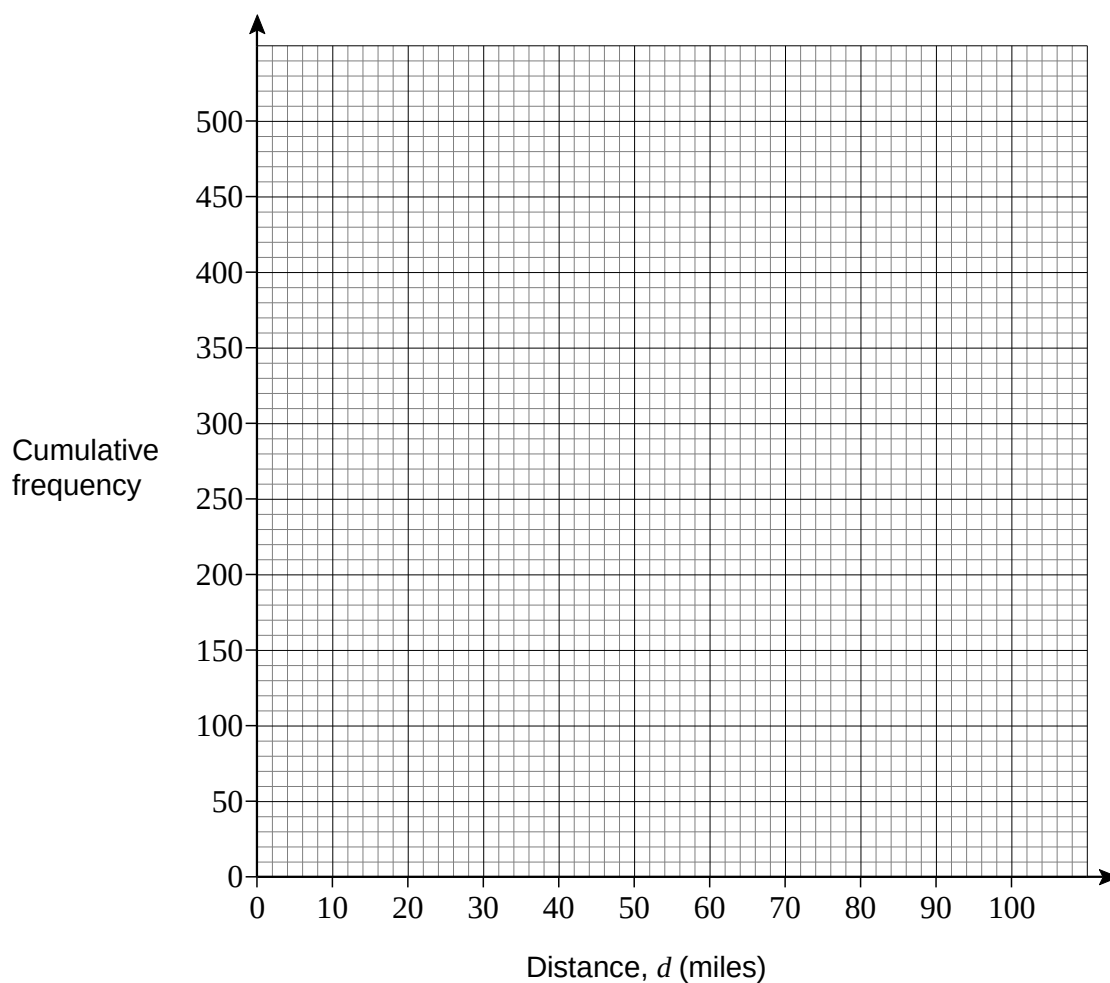
| Distance, $d$ (miles) | Frequency | Cumulative frequency |
|-----------------------|-----------|----------------------|
| $0 < d \leq 10$       | 0         | 0                    |
| $10 < d \leq 40$      | 60        | 60                   |
| $40 < d \leq 60$      | 240       |                      |
| $60 < d \leq 80$      | 125       |                      |
| $80 < d \leq 100$     | 75        |                      |

- 3 (a) Complete the cumulative frequency column.

[1 mark]

- 3 (b) Show the information on a cumulative frequency graph.

[3 marks]

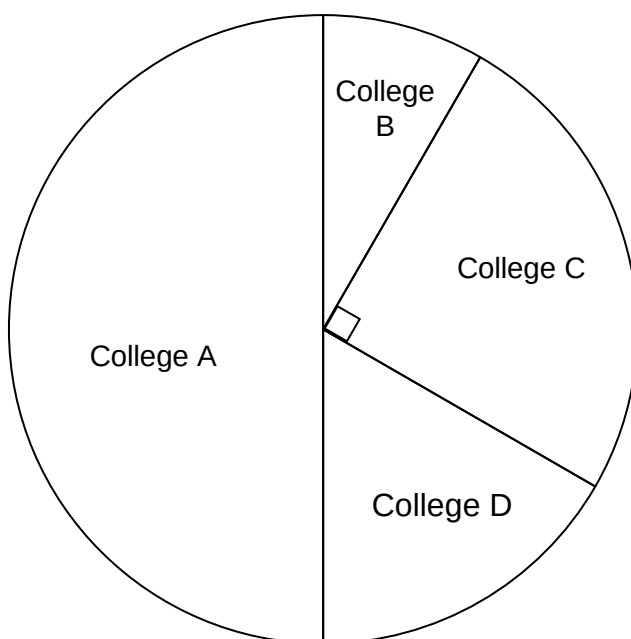


- 3 (c)** Deliveries under  $x$  miles are free.  
50 of the deliveries were free.  
Use your graph to estimate  $x$ .

**[1 mark]**

Answer \_\_\_\_\_

- 4** The pie chart shows information about the number of students attending four colleges.



1200 students attend College D.

Altogether, how many students attend all the colleges?

**[3 marks]**

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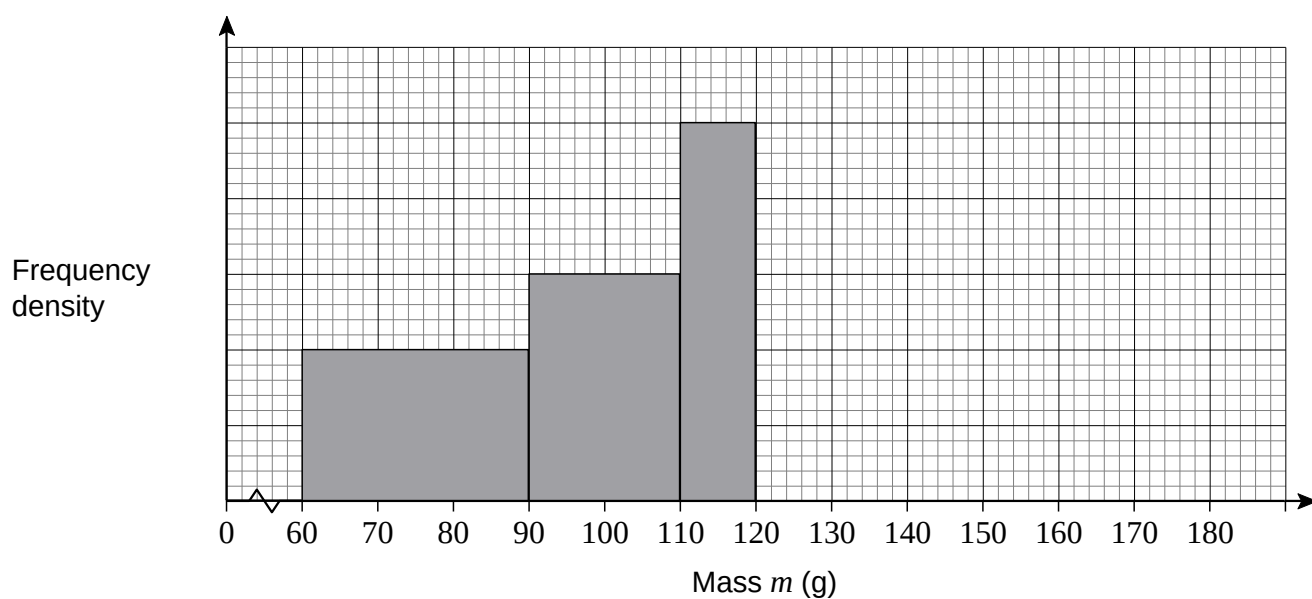


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Answer \_\_\_\_\_

5 The table and histogram give some information about the masses of 600 hamsters.

| Mass, $m$ (g)      | Frequency |
|--------------------|-----------|
| $60 < l \leq 90$   | 120       |
| $90 < l \leq 110$  |           |
| $110 < l \leq 120$ |           |
| $120 < l \leq 140$ | 180       |
| $140 < l \leq 180$ | 80        |
| Total = 600        |           |



Complete the table and the histogram.

[4 marks]

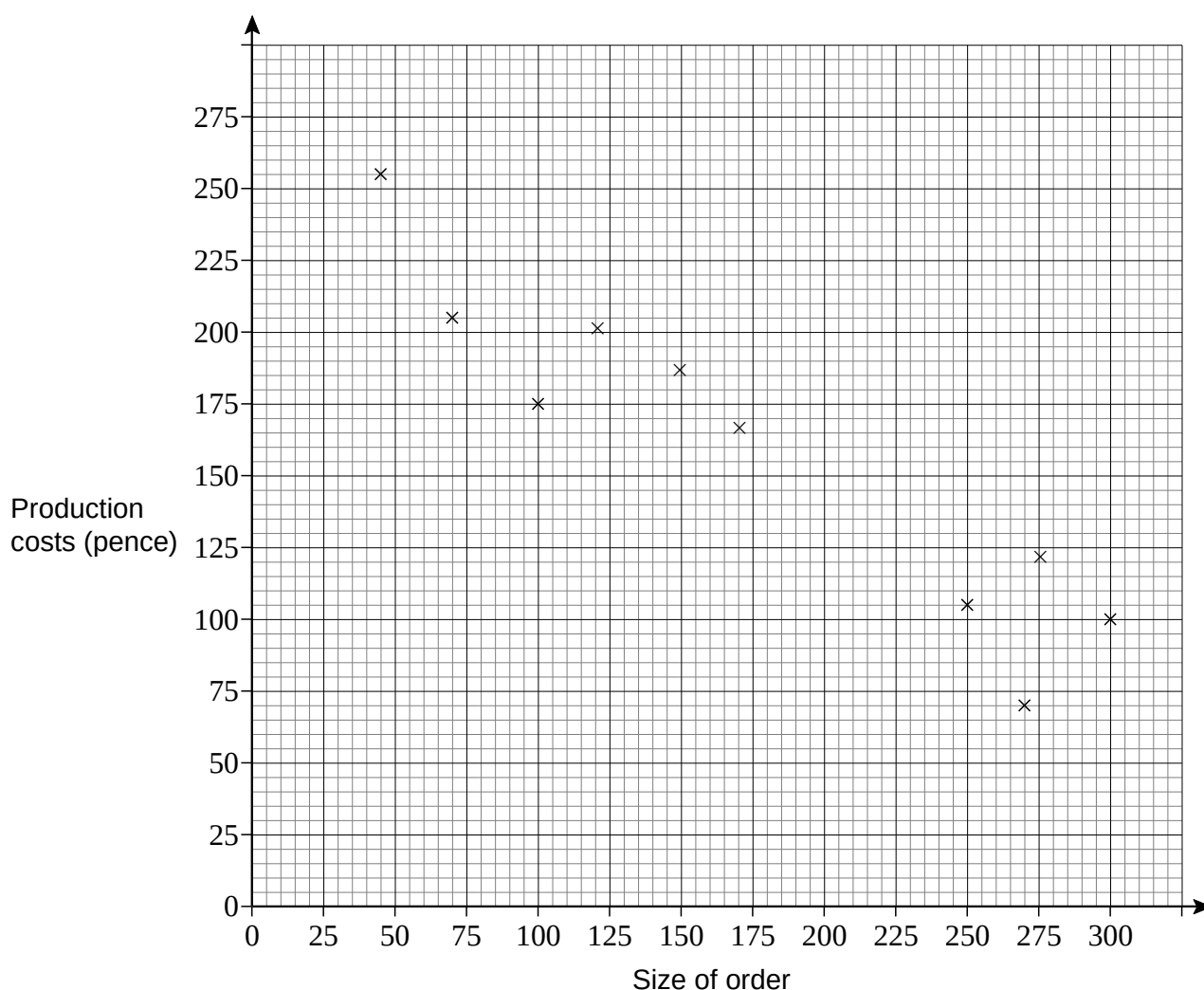
# Statistics recap and review – Higher



Sparx  
codes

|                                              |      |
|----------------------------------------------|------|
| Plotting scatter graphs                      | U199 |
| Interpreting scatter graphs                  | U277 |
| Drawing histograms with equal class widths   | U185 |
| Drawing histograms with unequal class widths | U814 |
| Interpreting histograms                      | U983 |
| Calculating averages from histograms         | U267 |
| Drawing box plots                            | U879 |
| Interpreting box plots                       | U837 |

- 1 A company produces custom T-shirts.  
The cost of producing each shirt depends on the design and size of order.  
The scatter graph shows information about production costs for 10 orders.





**1 (a)** The company charges

£8 per T-shirt for orders of less than 100

£7 per T-shirt for orders of 101 to 200

£6 per T-shirt for orders over 201

How much profit did they make on the order for 45 T-shirts?

**[2 marks]**

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Answer £ \_\_\_\_\_

**1 (b)** An order is received for 200 T-shirts.

Work out an estimate of the production costs.

**[1 mark]**

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Answer \_\_\_\_\_ pence

**1 (c)** An order for 600 T-shirts is received.

Can the scatter graph be used to estimate the production cost?

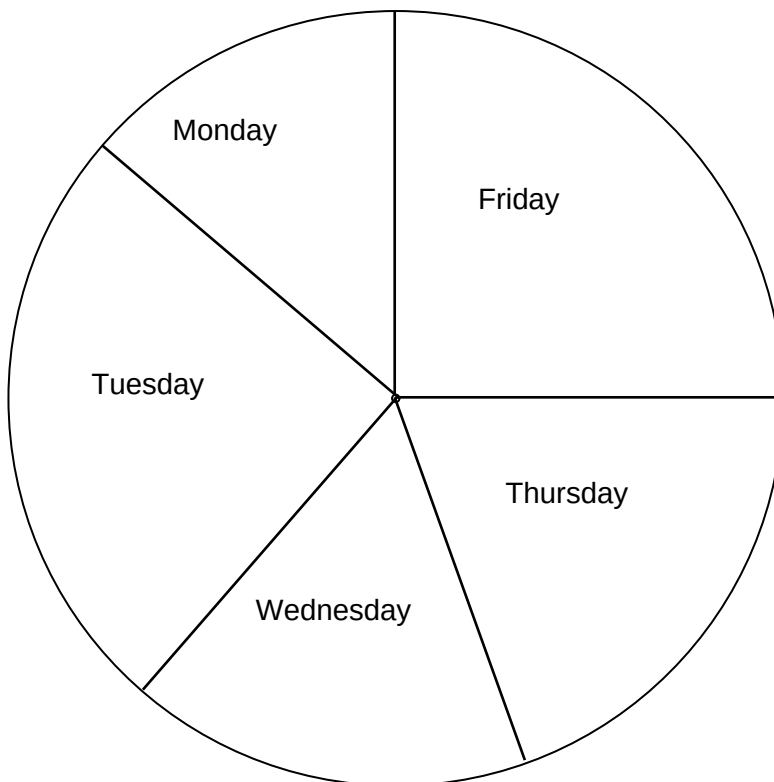
Give a reason for your answer.

**[1 mark]**

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- 2 The pie-chart, which is drawn accurately, represents the number of Year 11 students absent from school for one week.



There were 10 students absent on Monday.

Draw a suitable diagram to show the information numerically.

**[2 marks]**

- 3** The table shows the number of units of gas used for 6 months.  
The data for March is missing.

| Month    | Units of gas used |
|----------|-------------------|
| January  | 208               |
| February | 367               |
| March    |                   |
| April    | 156               |
| May      | 132               |
| June     | 98                |

The average number of units used over the 6 months is 210 units per month.

Work out the number of units used in March.

**[2 marks]**

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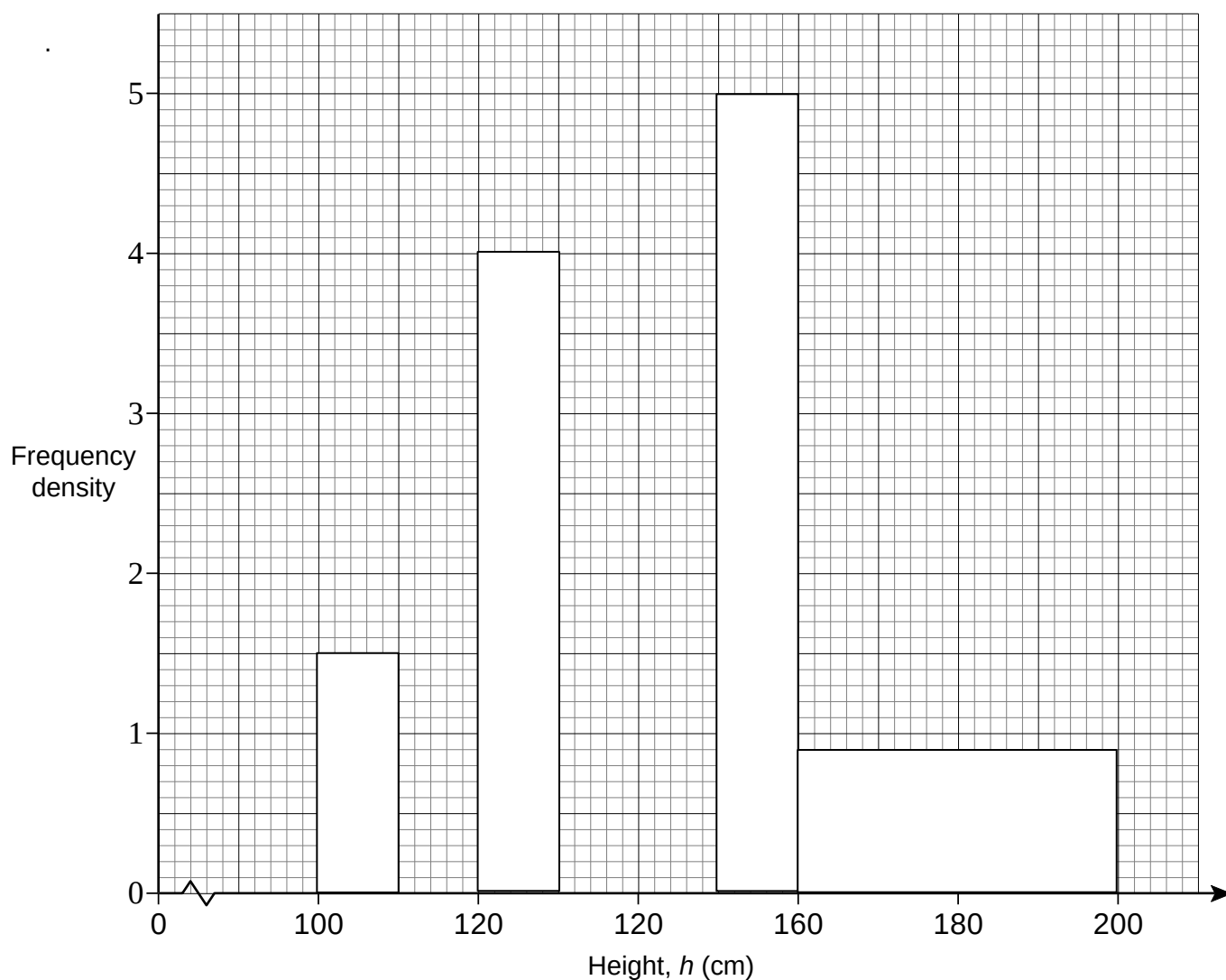


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Answer \_\_\_\_\_ units

4 The table and the histogram shows some information about the heights of 275 sunflowers.

| Height, $h$ (grams) | Frequency |
|---------------------|-----------|
| $100 < h \leq 110$  | 15        |
| $110 < h \leq 120$  | 30        |
| $120 < h \leq 130$  |           |
| $130 < h \leq 150$  |           |
| $150 < h \leq 160$  | 50        |
| $160 < h \leq 200$  | 35        |
| Total               | 260       |



**4 (a)** Complete the histogram and the table.

**[4 marks]**

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**4 (b)** Show that an estimate of the median is 140

**[2 marks]**

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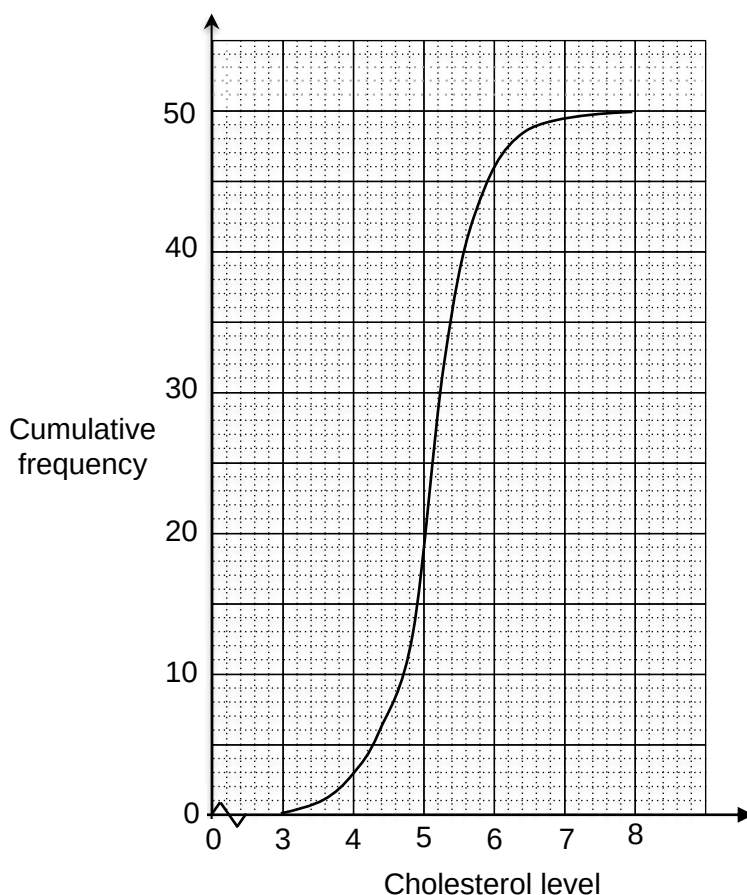
**4 (c)** What assumption have you made in making your estimate in part (b)

**[1 mark]**

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- 5 The cumulative frequency graph shows the cholesterol level of 50 meat-eaters.



- 5 (a) A cholesterol level of over 5.5 is considered to be high.

Work out an estimate of the percentage of the population that have a high cholesterol level.  
[2 marks]

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Answer \_\_\_\_\_ %

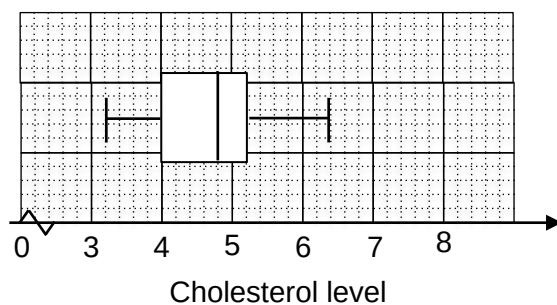
- 5 (b) Explain the likely effect of any assumptions have you made in making the estimate in part (a).

[1 mark]

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- 5 (c) 50 vegetarians also had their cholesterol level tested.

The box plot shows the results.



Compare the cholesterol levels of the meat eaters and the vegetarians.

[2 marks]

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# Statistical measures – Higher



Sparx  
codes

|                                                 |      |
|-------------------------------------------------|------|
| Calculating the mean                            | U291 |
| Finding averages from frequency tables          | U569 |
| Finding averages from diagrams                  | U854 |
| Finding averages from grouped data              | U877 |
| Choosing suitable averages and solving problems | U717 |

- 1 Here is a table of weekly wages in a small kitchen fitting company

| Job       | Number of employees | Weekly wage |
|-----------|---------------------|-------------|
| Labourers | 5                   | £240        |
| Driver    | 1                   | £300        |
| Foreman   | 1                   | £340        |
| Designers | 2                   | £500        |
| Owner     | 1                   | £1500       |
| Total     | 10                  |             |

- 1 (a) Work out the median weekly wage.

[1 mark]

Answer £ \_\_\_\_\_

- 1 (b) Give a reason why the mean would not be a good measure for the average wage in the company.

[1 mark]

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- 2 Roxy's class have a mathematics test next week.  
She has this hypothesis

'The more revision you do, the better you will do in the test'

Describe how she could test her hypothesis.

**[4 marks]**

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**3** The table shows the mass of 50 gerbils.

| Mass, $m$ (grams) | Frequency |
|-------------------|-----------|
| $50 < m \leq 55$  | 3         |
| $55 < m \leq 60$  | 9         |
| $60 < m \leq 65$  | 18        |
| $65 < m \leq 70$  | 12        |
| $70 < m \leq 75$  | 8         |

**3 (a)** Work out an estimate of the mean mass of the gerbils.

**[3 marks]**

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Answer \_\_\_\_\_ grams

**3 (b)** What assumption have you made in calculating the mean mass?

**[1 mark]**

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- 4** Trevor stood by a turnstile at a football ground.  
He counted the number of males and females that passed through for 1 minute.  
The table shows the results.

|        |     |
|--------|-----|
| Male   | 148 |
| Female | 22  |

- 4 (a)** In total 43 697 people attended the match.

Estimate the number of women that attended the match.

**[2 marks]**

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Answer \_\_\_\_\_

- 4 (b)** What assumption have you made in making your estimate?

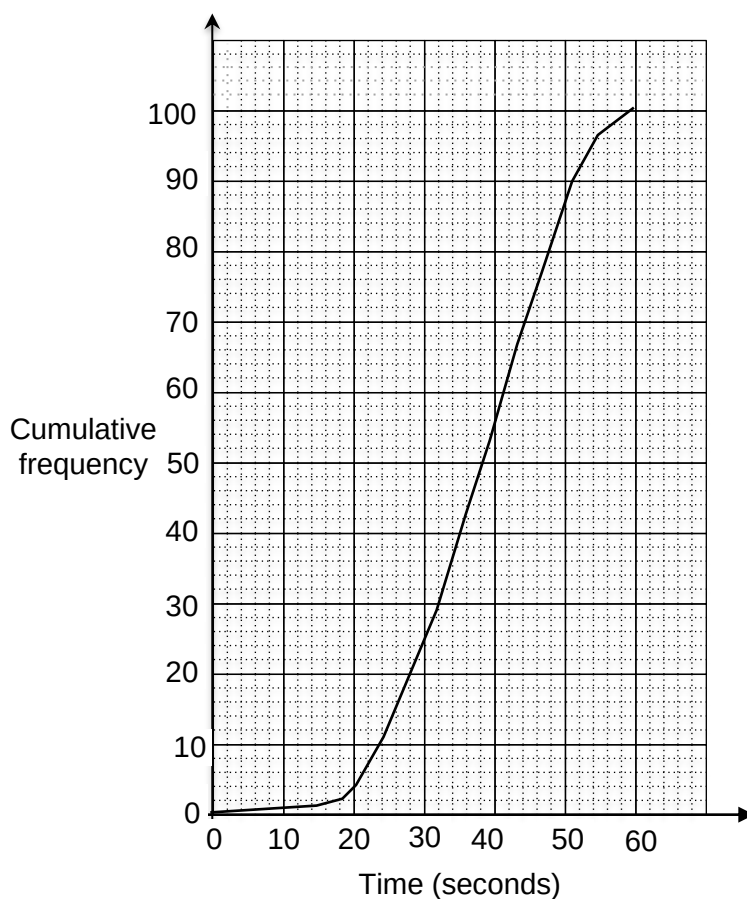
**[1 mark]**

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- 5 The cumulative frequency graph shows the time taken by 100 university students to solve a mathematical puzzle.



- 5 (a) Work out the median time.

[1 mark]

Answer \_\_\_\_\_ seconds

- 5 (b) Work out the inter-quartile range.

[1 mark]

Answer \_\_\_\_\_ seconds

- 7 (c)** 100 high school students were asked to solve the same puzzle.  
The table shows their results.

|        |            |
|--------|------------|
| Median | 48 seconds |
| IQR    | 12 seconds |

Compare the results of the university and high school students.

**[2 marks]**

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# Basic probability – Higher



Sparx  
codes

Writing probabilities as fractions, decimals and percentages

U510

Sample space diagrams

U104

Frequency trees

U280

Calculating experimental probabilities

U580

- 1 Temi rolls two fair, six-sided dice.  
The two numbers rolled are added to give a total.

Work out the probability that the total is a single-digit prime number.

**[3 marks]**

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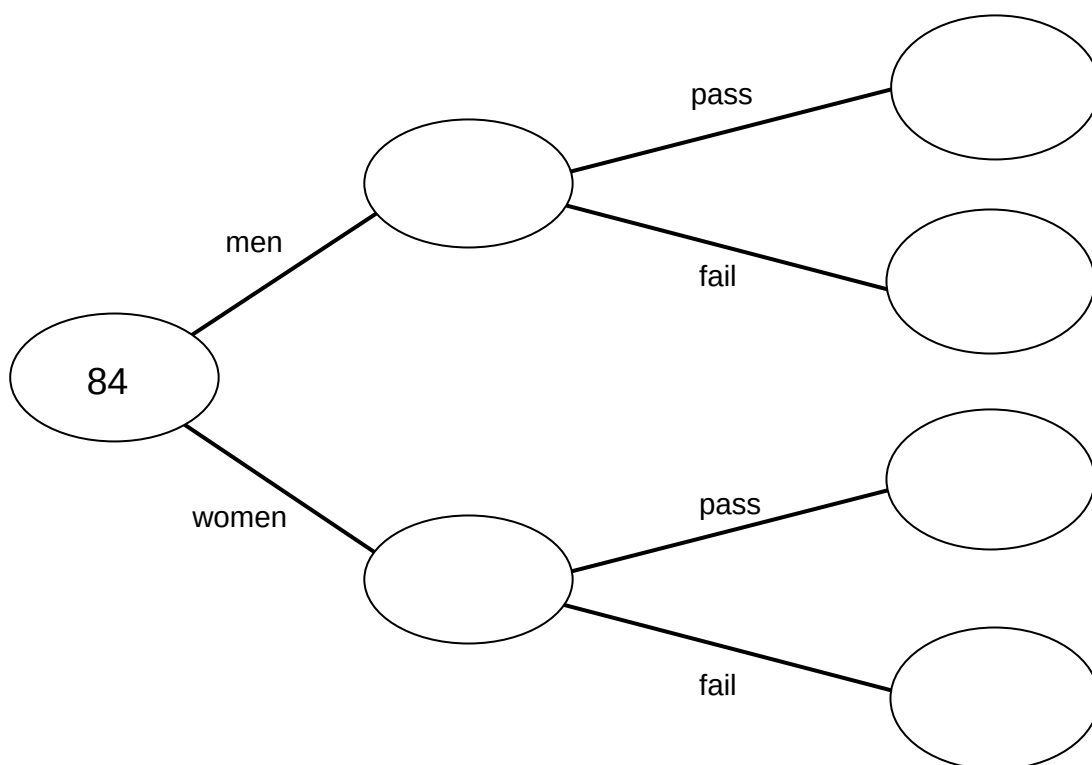
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Answer \_\_\_\_\_

- 2 84 people take a driving test.  
A quarter are men.  
For the men, the ratio pass : fail = 5 : 2  
The number of women who pass is double the number of women who fail.

2 (a) Complete the frequency tree.

[3 marks]



2 (b) One of the people is chosen at random

Work out the probability that it is a woman who passes.  
Give your answer as a fraction in its simplest form.

[2 marks]

Answer \_\_\_\_\_

- 3 A pond had 60 fish.  
27 were carp and the rest were tench.  
10 fish were added.

The probability that a fish picked at random is a carp is now  $\frac{1}{2}$

How many **tench** were added?

[3 marks]

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Answer \_\_\_\_\_

- 4 A box contains counters that are red, blue, yellow or green.  
The table shows some information about picking a counter at random.

|             | red | blue | yellow | green |
|-------------|-----|------|--------|-------|
| Probability |     | 0.25 | 0.35   | 0.3   |

There are 40 blue counters.

How many red counters are there?

[4 marks]

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Answer \_\_\_\_\_



**5** 120 students have Maths or Science next lesson.

There are 12 more boys than girls altogether.

The ratio Maths : Science = 2 : 3

Half as many girls have Maths as have Science.

**5 (a)** Complete the table.

**[4 marks]**

|         | Boys | Girls | Total |
|---------|------|-------|-------|
| Maths   |      |       |       |
| Science |      |       |       |
| Total   |      |       | 120   |

**5 (b)** A student is chosen at random.

Work out the probability that it is a boy who has Maths.

**[1 mark]**

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Answer 

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# Venn diagrams, tree diagrams and relative frequency– Higher



Sparx  
codes

|                                              |      |
|----------------------------------------------|------|
| Venn diagrams                                | U476 |
| Venn diagrams with set notation              | U748 |
| Using set notation                           | U296 |
| Conditional probabilities from Venn diagrams | U699 |
| Tree diagrams for independent events         | U558 |
| Tree diagrams for dependent events           | U729 |
| Expected results from repeated experiments   | U166 |

- 1 A fair spinner has 10 sections numbered from 1 to 10  
Here are the results of 12 spins.

3 5 8 4 1 2 6 2 2 2 2 2

Circle the probability of getting a 2 on the next spin.

[1 mark]

$$\frac{6}{13}$$

$$\frac{6}{12}$$

$$\frac{1}{10}$$

$$\frac{2}{10}$$

1

- 2  $\xi = \{230 \text{ students in a school}\}$

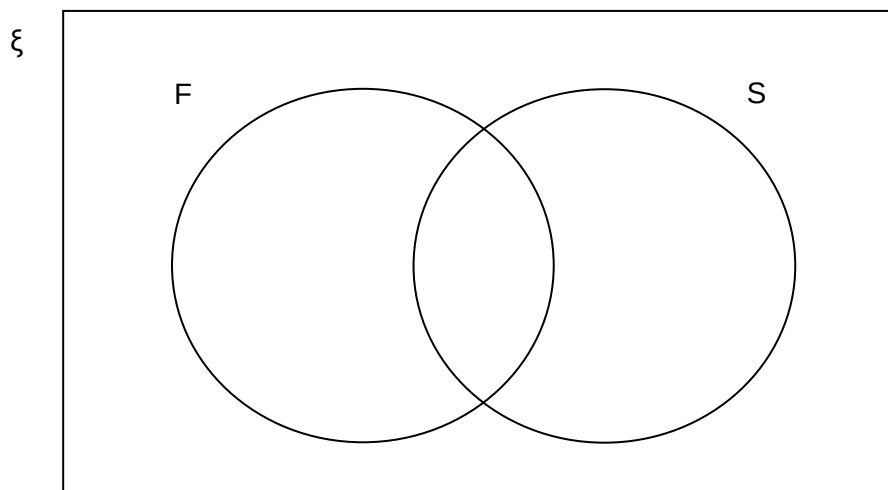
147 students take French (F).

94 students take Spanish (S).

15 students do **not** take French or Spanish.

- 2 (a) Complete the Venn diagram.

[3 marks]



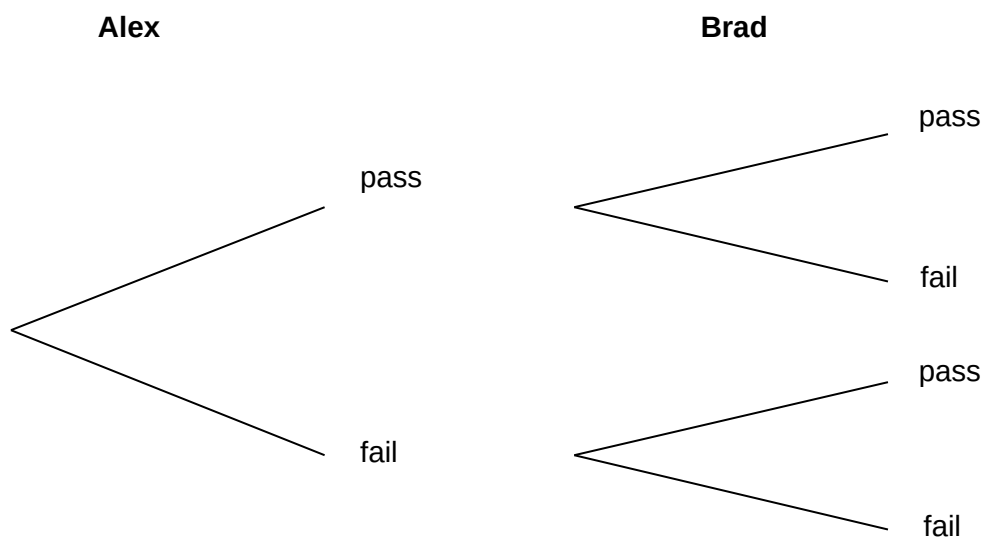
**2 (b)** A student is chosen at random.

Work out the probability that the student takes Spanish but not French.

**[1 mark]**

Answer \_\_\_\_\_

**3** Alex has an 80% chance of passing a test.  
Brad has a 60% chance of passing the test.

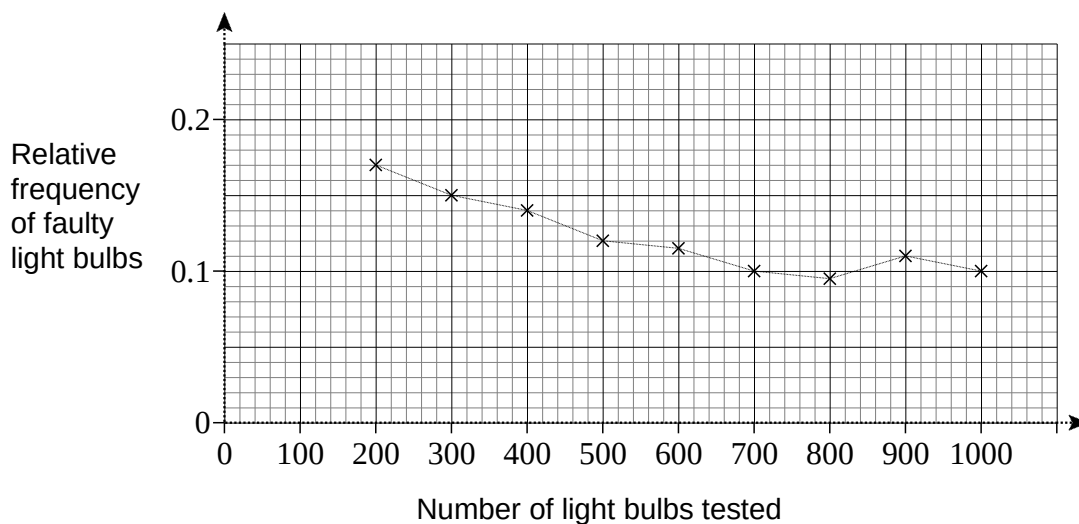


Work out the probability that Alex and Brad both fail the test.

**[2 marks]**

Answer \_\_\_\_\_

- 4 A factory makes light bulbs.  
The graph shows the relative frequency of faulty light bulbs.



- 4 (a) 16 of the first 100 light bulbs are faulty.  
Plot the relative frequency on the graph.

[1 mark]

- 4 (b) The factory makes 20 000 light bulbs one month.  
Work out the best estimate of the number of faulty light bulbs.

[2 marks]

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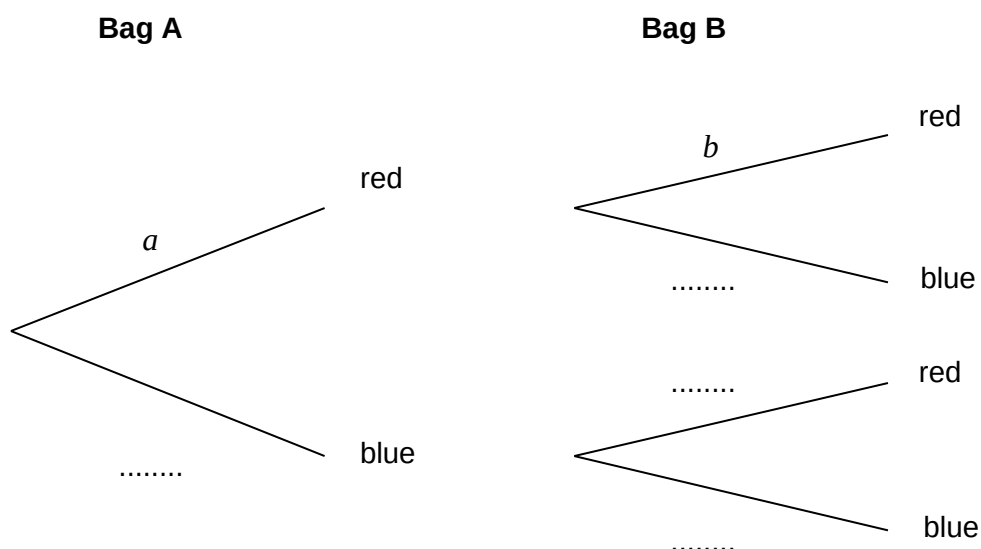
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Answer \_\_\_\_\_

- 5 Two bags both have red counters and blue counters.  
A counter is chosen at random from each bag.



- 5 (a) Circle the expression for the probability of choosing a blue counter from Bag A.

[1 mark]

$1 - a$ 
 $100 - a$ 
 $a - 1$ 
 $\frac{a}{2}$

- 5 (b) Write down an expression for the probability of choosing a blue counter from A and B.

[1 mark]

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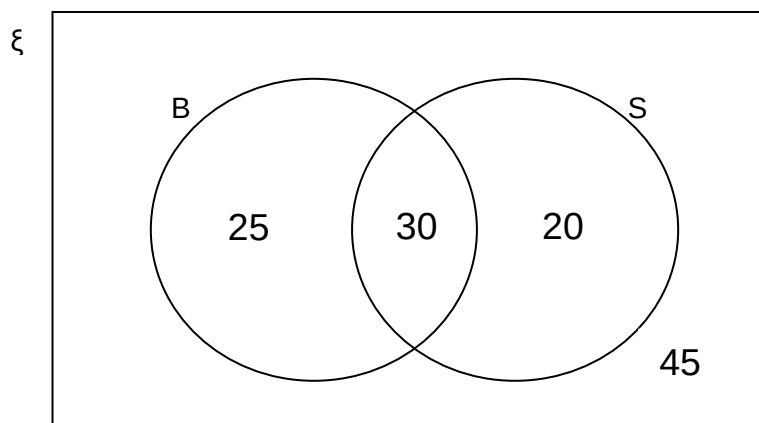
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Answer \_\_\_\_\_

6 In the Venn diagram,  $\xi = \{\text{eggs collected one morning}\}$

Set B = {brown eggs} Set S = {small eggs}

Eggs are brown or white, small or large.



6 (a) An egg is chosen at random.

Work out the probability that the egg is large and white.

[2 marks]

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Answer \_\_\_\_\_

6 (b) The first egg is replaced.  
Two more eggs are chosen at random for breakfast.

Work out the probability that one is brown and one is white.

[3 marks]

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Answer \_\_\_\_\_

- 7 100 people were asked if they owned a cat or a dog or both.

The two-way table shows some of the results.

|                  | Own a dog | Do not own a dog |
|------------------|-----------|------------------|
| Own a cat        | 13        | 27               |
| Do not own a cat | 32        |                  |

- 7 (a) Complete the two-way table to show the number who do **not** own a cat or a dog.

[1 mark]

- 7 (b) A cat owner is chosen at random.

Work out the probability that this person does **not** own a dog.

[1 mark]

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Answer \_\_\_\_\_

- 7 (c) A person who does **not** own a cat is chosen at random.

Work out the probability that this person owns a dog.

[1 mark]

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Answer \_\_\_\_\_